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DOCTORAL THESIS

From Social Tagging to Polyrepresentation:

A Study of Expert Annotating Behavior of Moving Images

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Getafe, November 2015

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Vocal:	(Nombre y apellidos)
Secretario:	(Nombre y apellidos)

Calificación:

Getafe, de de

Acknowledgements

This thesis work was possible thanks to the support and generous collaboration of several people and institutions. I especially wish to acknowledge my supervisor, Prof. Eva Méndez Rodríguez, for having supported me since the first time I met her, and for the experienced advice, friendly motivation and valuable input. I also would like to thank the Library and Information Science Department at Carlos III University in Madrid for accepting me as a researcher within the PIF program (scholarships for trainee researchers) between 2011 and 2015.

The studies that constitute this thesis were done thanks to the hospitality and arrangements of three institutions that I visited during the research period: Vrije Universiteit Amsterdam (VU), Utrecht University, and the Netherlands Film Museum (EYE); and to Dr. Marina Díaz López, from the Cervantes Institute, who facilitated the contact with renowned film scholars in Spain. This thesis grew from their and other people's important contributions. I also thank Virginia Ortiz Repiso, for her trust and diligence in arranging the internships. My especial acknowledgments to those who contributed to the essential task of interpretive qualitative research that is conducted in this thesis, since without them meaning and interpretation could not have been possible.

I thank Hugo Huurdeman for the essential help, fruitful discussions, and inspiration for the daily work. Also, my sincere gratitude to Prof. Peter Ingwersen for his kind support and generous clarifications and materials about the IS&R model, I adhere to the numerous people and institutions that have acknowledged his important contributions to the field. I also thank Michiel Hildebrand, Jacco van Ossenbruggen, and Victor de Boer, from Vrije Universiteit Amsterdam, especially Victor for his dedicated enthusiasm in finalizing our paper, and for visiting our research group in Madrid. My deepest gratitude also to Prof. Frank Kessler, from Utrecht University, for inviting me to be close to the fascinating world of early cinema researchers, and for his warm welcome to the Media Studies department. I will always remember how amusedly he presented me to his colleagues explaining that they (the film scholars) were going to be my "subjects" of study. What he did not know is that film scholars were not the subject, but "the heart of the investigation." Also, my special acknowledgments to Dr. Marina Díaz López for the arrangements during the study in Madrid, but mostly for her friendship and constant encouragement, I wish to express my admiration for her daily honest and dedicated work in favor of Spanish and Latin American cinema. My gratitude also to Prof. Giovanna Fossati, Nita Smith, Annelies van Niespen, Anke Bel, and Saskia Waterman at EYE, for having welcoming so openly in the archive, and for having invited me to engage in the exciting Desmet project. My acknowledgments also to Dr. Lynn Connaway, from OCLC, for crucial methodological advice and valuable comments to the initial draft.

At VU, I also thank Prof. Guus Schreiber for welcoming me in the four-month stage at the active, friendly, and outstanding Web and Media Research Group. I also thank Laura Hollink for her kindness and inspiring work.

At Utrecht University, I appreciate the warm hospitality of the professors, researchers, and Ph.D. students at the Media Studies Department. I am very thankful to the fourteen active staff members who participated in the interviews. My special acknowledgments to Sarah Dellman, Nico de Klerk, Eva Hielscher, and Claire Dupré Latour for their friendship and valuable insights during the film and media seminars and work in their theses. I also appreciate the kindness and help by Laura Copier, Hanna Surma, Kátilint Bálint, Willemien Sanders, Junting Zhang, Eliane Fankhauser, Lian Ko, and Wei Gui. My sincere acknowledgments to Prof. Peter Ellenbruch for his important contributions and generosity during one of the events that he attended at the University.

I also wish to thank Jasmijn van Gorp and Christian Olesen from Amsterdam University for welcoming me to the "Desmet demonstrator" project, and for their extra help. I also thank the special contributions of Prof. Ivo Blom and Prof. Julia Noordegraaf during my participation in that research. At EYE, I wish to thank also Ronny Temme, who generously shared her experience for almost a decade in the sales department, and to Rob Zeeman, from the Meertens Institute, former designer of EYE's catalog. I also appreciate the time and substantial contributions by curators and employees who participated in the study, especially to Rommy Albers, Soeluh van den Berg, Rixt Johnkman, Piet Dirkx, Leo Bosch, Irene Haan, Leenke Ripmeester and Elif Rongen.

The study I carried out during the stage at VU was possible thanks to the enthusiastic participation of 36 experts and novices around the world who played the *"Waisda?"* game and contributed with valuable comments. The co-authors of the resulting paper and I sincerely thank them. We also thank Erwin Verbruggen for contacts and advice, and our reviewers of the Journal of the Association for Information Science and Technology (JASIST) for their valuable input and suggestions. Also my sincere acknowledgments to the ten scholars that participated in the study in Madrid for their considerable amount of time, their insightful reflections and for generously sharing their expertise.

I also value the contribution of other film archivists or researchers that supported me at some point in this work: Anastasia Kerameos, Bryony Dixon and Maria-José de Esteban (from the British Film Institute), and Nancy Goldman for her generosity in her interview and discussion about the forthcoming FIAF cataloging rules. Also to Iris López de Solis, from the Spanish Radio and Television broadcaster, for her insightful talk about the "film researcher" profession, her interview, and her useful book. To Antonia Lant, Hower Besser, and Rutger Penne, for having shared part of their time during the FIAF Congress in Barcelona, and to Bregt Lammeris for her charming and insightful conversations. Also, special thanks to Prof. Gary Geisler, who kindly provided examples of his work with *crowdsoucing* film data.

At Carlos III University, I especially wish to acknowledge the dedicated staff of the library services, especially of the interlibrary loan service for providing a big number of necessary documents in a timely way, this thesis would not have been possible without their efficient and diligent work. I also wish to thank the friendly support and encouragement of colleagues and friends, especially from Maria Eugenia Iglesias (and Carlos), Ana Sierra, Maria Antonia

Ovalle, Ivett Aportela, Gema Bueno, David Rodríguez, Sara Martínez, Maria Luisa Lascurain, Maria Jesús Colmenero, Maria Jesús Pestaña, Belén Pérez, Loli, Marga, Ramón, and Javier Calzada. I also wish to thank Tony Hernández and the Tecnodoc Research Team for welcoming me in the group, Jesús Robledano for his solidarity, Sonia García for the extraordinary input; and Agustín Gamir, Carlos Manuel, and Víctor Aertsen for allowing me to participate in their interesting "Madrid in Film" project.

I wish to express my prevailing gratitude to the Inter-American Library School in Medellín (especially to Dídier Álvarez, Paola Ramírez, and Marta Silvia Molina), and to the coordinators, teachers and colleagues from the International Master in Digital Library Learning (DILL). I acknowledge each of them for the significant contributions to my professional, and more important, personal growth.

I am also very thankful to Victoria, Jose, Marina, and my office mates for their friendship and cheerful attentions during the years I lived in Spain. And, finally, I wish to express gratitude to my dear families and long-lasting friends in different space and time dimensions, to whom I dedicate the joy of the achievement.

Indicative Abstract

This thesis investigates "*nichesourcing*" (De Boer, Hildebrand, et al., 2012), an emergent initiative of cultural heritage *crowdsoucing* in which niches of experts are involved in the annotating tasks. This initiative is studied in relation to moving image annotation, and in the context of audiovisual heritage, more specifically, within the sector of film archives. The work presents a case study of film and media scholars to investigate the types of annotations and attribute descriptions that they could eventually contribute, as well as the information needs, and seeking and searching behaviors of this group, in order to determine what the role of the different types of annotations in supporting their expert tasks would be. The study is composed of three independent but interconnected studies using a mixed methodology and an interpretive approach. It uses concepts from the information behavior discipline, and the "Integrated Information Seeking and Retrieval Framework" (IS&R) (Ingwersen and Järvelin, 2005) as guidance for the investigation. The findings show that there are several types of annotations that moving image experts could contribute to a *nichesourcing* initiative, of which time-based tags are only one of the possibilities. The findings also indicate that for the different foci in film and media research, in-depth indexing at the content level is only needed for supporting a specific research focus, for supporting research in other domains, or for engaging broader audiences. The main implications at the level of information infrastructure are the requirement for more varied annotating support, more interoperability among existing metadata standards and frameworks, and the need for guidelines about *crowdsoucing* and *nichesourcing* implementation in the audiovisual heritage sector. This research presents contributions to the studies of social tagging applied to moving images, to the discipline of information behavior, by proposing new concepts related to the area of use behavior, and to the concept of "polyrepresentation" (Ingwersen, 1992, 1996) applied to the humanities domain.

Resumen Indicativo

Esta tesis investiga la iniciativa del *nichesourcing* (De Boer, Hildebrand, et al., 2012), como una forma de *crowdsoucing* en sector del patrimonio cultural, en la cuál grupos de expertos participan en las tareas de anotación de las colecciones. El ámbito de aplicación es la anotación de las imágenes en movimiento en el contexto del patrimonio audiovisual, más específicamente, en el caso de los archivos fílmicos. El trabajo presenta un estudio de caso aplicado a un dominio específico de expertos en el ámbito audiovisual: los académicos de cine y medios. El análisis se centra en dos aspectos específicos del problema: los tipos de anotaciones y atributos en las descripciones que podrían obtenerse de este nicho de expertos; y en las necesidades de información y el comportamiento informacional de dicho grupo, con el fin de determinar cuál es el rol de los diferentes tipos de anotaciones en sus tareas de investigación. La tesis se compone de tres estudios independientes e interconectados; se usa una metodología mixta e interpretativa. El marco teórico se compone de conceptos del área de estudios de comportamiento informacional ("information behavior") y del "Marco integrado de búsqueda y recuperación de la información" ("Integrated Information Seeking and Retrieval Framework" (IS&R)) propuesto por Ingwersen y Järvelin (2005), que sirven de guía para la investigación. Los hallazgos indican que existen diversas formas de anotación de la imagen en movimiento que podrían generarse a partir de las contribuciones de expertos, de las cuáles las etiquetas a nivel de plano son sólo una de las posibilidades. Igualmente, se identificaron diversos focos de investigación en el área académica de cine y medios. La indexación detallada de contenidos sólo es requerida por uno de esos grupos y por investigadores de otras disciplinas, o como forma de involucrar audiencias más amplias. Las implicaciones más relevantes, a nivel de la infraestructura informacional, se refieren a los requisitos de soporte a formas más variadas de anotación, el requisito de mayor interoperabilidad de los estándares y marcos de metadatos, y la necesidad de publicación de guías de buenas prácticas sobre de cómo implementar iniciativas de *crowdsoucing* o *nichesourcing* en el sector del patrimonio audiovisual. Este trabajo presenta aportes a la investigación sobre el etiquetado social aplicado a las imágenes en movimiento, a la disciplina de estudios del comportamiento informacional, a la que se proponen nuevos conceptos relacionados con el área de uso de la información, y al concepto de "poli-representación" (Ingwersen, 1992, 1996) en las disciplinas humanísticas.

Informative Abstract

The cultural heritage sector has embraced social tagging as a way to increase both access to online content and to engage users with their digital collections. A further step in refining the advantages of this form of *crowdsoucing*, and to overcome limitations, is to involve domain experts in the annotating process. One emergent initiative in this direction is called "*nichesourcing*" (de Boer et al., 2012), in which niches of experts, instead of "the faceless crowd," provide high-quality annotations. This thesis is motivated by the need to investigate whether this initiative provides solutions to the problems of audiovisual content description for audiovisual heritage, and if it could be considered as an option for film and media archives to improve the quality of their moving image annotations.

In order to set the research problem context, an extensive literature review brings together the different perspectives for describing the content of moving images. From this overview, a holistic concept of "annotation" and "information-annotating behavior", and the use of a theoretical framework for its study are proposed. The concepts embrace not only tagging but also indexing and other forms of scholarly and professional annotation. The selected "Integrated Information Seeking and Retrieval Framework" (IS&R) (Ingwersen and Järvelin, 2005) is adapted for this investigation by incorporating these concepts into it. Two specific issues are investigated guided by this framework, and by concepts from the discipline of information behavior: (1) the types of annotations (and their semantic attributes) that could be obtained from a niche group, and (2), the information needs, and seeking and searching behaviors of this group, in order to determine what the role of the different types of annotations in supporting their expert tasks would be.

This work presents a case study of film and media scholars to investigate these problems, guided by three research questions (RQs). RQ1 inquires about the characteristics of film experts and scholars' tagging behavior and their attitudes towards tagging moving images. RQ2, with a broader scope of the "annotation" concept, seeks to describe film and media scholars' information-annotating behavior in relation to moving images, and the scholars' attitudes towards shared annotations. Finally, RQ3 comes from the need to know which types of annotations support film and media scholars who are seeking moving images, in the context of their research-related tasks, information needs, seeking and searching behavior. Each research question is linked to three independent but interconnected studies. The overall methodological approach of the thesis is interpretive, and the research is designed using a mixed methodology: qualitative and quantitative.

The study concludes that there are several types of annotations that moving image experts could contribute to a *nichesourcing* initiative, from which time-based tags are only one of the possibilities, and that the types of semantic attributes are related to the type of annotation. In addition, the findings also reveal different foci in film and media research, each of which is associated to different needs for accessing moving image content. This analysis shows that in-depth indexing at the content level is only needed in a few specific cases, or for research in

other domains, or for engagement of broader audiences. The final analysis suggests that *nichesourcing* is a necessary form of *crowdsoucing* related to the already existing need of offering research support by memory institutions, and that it could have a positive impact on film and media scholarship, as well as on moving image access.

This thesis does not investigate the specific requirements for technical implementation or project management of *crowdsoucing* or *nichesourcing* initiatives in memory institutions. However, the thesis includes implications at the level of information infrastructure, one of the most important ones being the need for more interoperability between different standards, as well as for guidelines or best practices authored by standardization bodies and professional associations in the audiovisual domain. Likewise, more research in the information behavior field of studies is needed to understand people's interactions with information in the form of annotations.

The study contributes to research and practice at these levels: (1) to the study of social tagging applied to the audiovisual domain; (2) to the discipline of information behavior, through a case study of an expert group, and the proposal of new concepts; and (3) to the concept of polyrepresentation (Ingwersen, 1992, 1996) applied to representations in the humanities.

Resumen Informativo

Las instituciones en el sector del patrimonio cultural han encontrado en el etiquetado social una forma de aumentar el acceso a sus colecciones y de fortalecer el vínculo con sus usuarios. La iniciativa del *nichesourcing* (Boer, Hildebrand, et al., 2012), trata de mejorar las ventajas y superar las desventajas asociadas a la calidad de las anotaciones, inherentes al proceso de obtención a través de usuarios no expertos (o cuyo nivel de conocimiento en un dominio o habilidad se desconoce), involucrando a grupos o nichos de expertos que puedan proporcionar anotaciones de alta calidad. Esta tesis está motivada por la necesidad de investigar si esta iniciativa representa una solución al problema de descripción de contenidos audiovisuales del patrimonio audiovisual, y si podría ser considerada como una opción para los archivos en el sector con el fin de mejorar la calidad de las anotaciones de las imágenes en movimiento.

Con el fin de establecer el contexto del problema de investigación descrito, se presenta una revisión de la literatura en la que, de manera comprensiva, se describen las diferentes perspectivas que existen a la fecha para la descripción de las imágenes en movimiento. A partir de este estado de la cuestión, se propone un concepto más amplio de "anotación", así como el concepto de "comportamiento informacional durante la anotación" ("information-annotating behavior"), que incluye actos como el etiquetado, pero también la indexación tradicional, y otras formas de anotación académicas y profesionales. Dicho concepto es incorporado en un constructo teórico existente en ese ámbito de estudios, el llamado "Marco integrado de búsqueda y recuperación de la información" ("Integrated Information Seeking and Retrieval Framework" (IS&R)) propuesto por Ingwersen y Järvelin (2005), el cual se adapta a través de la incorporación de los conceptos sugeridos. Esta investigación se guía por dicho marco teórico y se basa en los conceptos de la disciplina de "estudios del comportamiento informacional" (Information Behavior), enfocándolos al análisis de dos aspectos específicos del problema: (1) los tipos de anotaciones (y sus atributos) que podrían obtenerse de un nicho de expertos, y (2), la comprensión de las necesidades de información y el comportamiento informacional de dicho grupo, con el fin de determinar cuál es el rol de los diferentes tipos de anotaciones en el apoyo a sus tareas de expertos.

Esta tesis presenta un estudio de caso aplicado a un dominio específico de expertos en el ámbito audiovisual: los académicos de cine y medios. El estudio se diseña a partir de tres preguntas de investigación (P). P1 investiga las características del comportamiento en etiquetado social de los expertos, así como sus actitudes hacia el etiquetado de imágenes en movimiento. Adoptando un concepto más amplio de anotación (no sólo a través de etiquetas), la P2 investiga el comportamiento informacional de los investigadores en relación a la anotación de imágenes en movimiento, así como sus actitudes hacia las anotaciones provenientes de contribuciones de otros expertos. Finalmente, la P3 se origina a partir de la necesidad de identificar cuáles son los tipos de anotaciones que apoyan la labor de búsqueda de los académicos de cine y medios durante tareas de investigación, de acuerdo a sus necesidades, preguntas de investigación y comportamiento informacional. El diseño incluye

tres estudios independientes e interconectados vinculados a cada pregunta de investigación. El marco metodológico de la tesis es interpretativo, y se usa una metodología mixta (cualitativa y cuantitativa).

Los principales hallazgos indican que existen diversas formas de anotación de la imagen en movimiento que podrían generarse a partir de las contribuciones de expertos, de las cuáles las etiquetas a nivel de plano son sólo una forma; así como que los tipos de atributos semánticos dependen del tipo de anotación. Además, se identifican diversos focos de investigación en el área de investigación académica de cine y medios, cada uno de los cuáles está asociado a distintas necesidades de acceso al contenido de las imágenes en movimiento. Los hallazgos indican que una indexación detallada a nivel de contenido sólo se requiere en el caso de uno de dichos focos, así como en investigaciones de otras disciplinas, o para atraer audiencias más amplias. El análisis final confirma que, en el ámbito del patrimonio audiovisual, *nichesourcing* es una forma necesaria del *crowdsoucing*, estrechamente vinculada a la existente necesidad de ofrecer apoyo a la investigación por parte de las instituciones responsables, la cual a su vez puede tener un impacto positivo en la investigación académica del ámbito audiovisual, así como en el acceso a las imágenes en movimiento.

La investigación no incluye el estudio de los requerimientos técnicos o de gestión para la implementación de iniciativas de *crowdsoucing* o *nichesourcing* a nivel institucional. Sin embargo, se incluye una descripción de las implicaciones en relación a la infraestructura informacional, entre las cuáles la más urgente parece ser la necesidad de mayor interoperabilidad entre diversos estándares, así como la necesidad de publicación de guías por los organismos de estandarización y las asociaciones profesionales del sector. Así mismo, se requiere más investigación en el campo de estudios del comportamiento informacional para comprender las formas de interacción de las personas cuando realizan tareas de anotación.

El estudio contribuye a la investigación y práctica a los siguientes niveles: (1) al estudio de la aplicación del etiquetado social en el ámbito audiovisual; (2), a la disciplina de estudios del comportamiento informacional, a través de un estudio de caso de un grupo de expertos, y de la propuesta de nuevos conceptos; y (3), al concepto de “poli-representación” (Ingwersen, 1992, 1996) aplicado a las representaciones en las disciplinas humanísticas.

Abridged Table of Contents

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List of Abbreviations and Acronyms

§	Section of this document
-a	Aesthetic research focus (participant's quotes, Study C)
AACR	Anglo-American Cataloging Rules
AAT	Art and Architecture Thesaurus
AB	Annotating Behavior (aspect for the study of)
AI	Artificial Intelligence
AMIA	Association of Moving Image Archivists
APIs	Application Programming Interfaces
APPM	Archives, Personal Papers, and Manuscripts
ASIS&T	Association for Information Science and Technology
ASK	Anomalous State of Knowledge
AXES	Acces to Audiovisual Archives Project
B&G	Beeld en Geluid (The Netherlands Institute for Sound and Vision)
BBC	British Broadcasting Corporation
BFI	British Film Institute
BIBFRAME	Bibliographic Framework Initiative (LC)
CAQDAS	Computer Assisted Qualitative Data AnalysiS (also known as QDA)
CATCH	The Continuous Access to Cultural Heritage (Dutch research program)
CBIR	Content-based image retrieval
CBVR	Content-based video retrieval
CCO	Cataloging Cultural Objects
-c/d	Cultural/Documental research focus (participant's quotes, Study C)
CDWA	Categories for the Description of Works of Art (Getty Institute)
CIDOC	ICOM (International Council of Museums) International Committee for Documentation
CIDOC CMR	The CIDOC Conceptual Reference Model
Conc.	Conclusion
CWA	Cognitive Work Analysis
DARIAH	Digital Research Infrastructure for the Arts and Humanities
DC	Dublin Core
DCMES	Dublin Core Metadata Element Set
DMS	Descriptive Metadata Scheme
-e	Epistemologic research focus (participant's quotes, Study C)
EAD	Encoded Archival Description
EBU	European Broadcasting Union
EBU P/META	The EBU Semantic Metadata Schema
EBUCore	The EBU Core metadata set for audiovisual content
EDItEUR	The international group coordinating development of the standards infrastructure for electronic commerce in the book, e-book and serials sectors
Exif	Exchangeable image file format
EYE	The Netherlands Film Museum
FIAF	The International Federation of Film Archives
FIAT/IFTA	Fédération Internationale des Archives de Télévision (International Federation of Television Archives)
FRAD	(FRBR) Functional Requirements for Authority Data

FRBR	Functional Requirements for Bibliographic Records
FRBRoo	FRBR object-oriented
FRSAD	(FRBR) Functional Requirements for Subject Authority Data
GT	Grounded Theory
GTAA	Gemeenschappelijke Thesaurus Audiovisuele Archieven (Common Thesaurus Audiovisual Archives)
-h	Social media history research focus (participant's quotes, Study C).
HCI	Human Computer Interaction
IB	Information Behavior
ID2/ID3	ID3 tags are the audio file data standard for MP3 files in active use by software and hardware developers
IFLA	Federation of Library Associations and Institutions
IIR	Interactive Information Retrieval
Inf.	information
IR	Information Retrieval (discipline)
IS&R	Information Seeking and Retrieval
ISAD	International Standard Archival Description
ISAD(G)	General International Standard Archival Description
ISAN	International Standard Audiovisual Number, ISO 15706
ISBD	International Standard Bibliographic Description
ISO	International Organization for Standardization
IT	Information Technologies
JASIST	Journal of the Association for Information Science and Technology.
KOS	Knowledge Organization System
LAM	Libraries, Archives and Museums (also known as LAM; or GLAM, including galleries)
LC	Library of Congress
LCSH	Library of Congress Subject Headings
LEMO	Linked Educational Medical Objects
LIDO	Lightweight Information Describing Objects
LIS	Library and Information Sciences; also used to refer to Information Science(s)
LISA	Library and Information Science Abstracts database
LISTA	Library, Information Science & Technology Abstracts database
LOD	Linked Open Data
LOV	Linked Open Vocabularies
LSCOM	Large Scale Concept Ontology for Multimedia
MAM	Media Assets Management System
MARC	MAchine-Readable Cataloging record
MEP	Media Ecology Project
MESH	Medical Subject Headings
MIC	Moving image catalog? (disappeared)
MIG-FG	Moving Image Genre-Form Guide
MPEG-21	Framework Multimedia (Moving Picture Experts Group)
MPEG-7	Multimedia Content Description Interface (Moving Picture Experts Group)
MUTO	Modular Unified Tagging Ontology
NAMID	National Moving Image Database
NFPB	National Film Preservation Board (LC)
NFTVA	National Film and Television Archive (UK)

NLP	Natural Language Processing
OCR	Optical Character Recognition
ONIX	ONline Information eXchange
OPAC	Online Public Access Catalog
p1;p2…	Participant's number (Study B, C)
PAIN	Personal Anticipated Information Need
PBCore	Public Broadcasting Metadata Dictionary Project
PubMed	Search engine accessing primarily the MEDLINE (Medical Literature Analysis and Retrieval System Online) database
q.	Question (to indicate question number from a questionnaire used in this thesis)
QDA	Qualitative Data Analysis (also known as CAQDAS)
RAD	Rules for Archival Description
RDA	Resource Description and Access
RDF	Resource Description Framework
RQ	Research question
rw	Referred website (superscript mark).
s.	Sentence
SB; SC	Study B or C in this thesis (used only for participants' quotes)
SKOS	Simple Knowledge Organization System
SMEF	Standard Media Exchange Framework
SMPTE	Society of Motion Picture & Television Engineers
SPECTRUM	Museum Documentation Standard (in the UK)
TEI	Text Encoding Initiative
TREC	Text REtrieval Conference
UDC	Universal Decimal Classification
UGC	User-generated content
VES	Vocabulary Encoding schemes
VIRAMI	Visual Information Retrieval for Archival Moving Imagery
VRA	Visual Resources Association
W&N	Wants and Needs Analysis
W3C	World Wide Web Consortium
WGBH	Member station of PBS: Public Broadcasting Service in the United States
XMP	Extensible Metadata Platform

Writing Conventions

The following are the conventions that are used along this work, in order to guarantee that the readers from different backgrounds can understand the terminology and follow further references:

- Definitions and scope notes (i.e., how the terms are used in this thesis) are provided in each chapter and in a glossary (Appendix A). The terms that are included in the glossary appear with an asterisk in the text (e.g., film*) the first time they are mentioned, or in subsequent times when pointing to a definition is needed.

- Referred projects and websites are listed after the reference list at the end of this thesis. Each website that is mentioned and listed in that section appears with the abbreviation **(rw)**, referred website, in supperscript.

- There are three studies presented in this thesis. Their short names are: “Study A” (Chapter 5), “Study B,” or “SB” (Chapter 6), and “Study C,” or “SC” (Chapter 7).

- Direct or paraphrased quotes from the thesis studies’ participants are frequently used in each study’s chapter, and across two studies. This is done by using the participant’s code. For example, the citation *(p1)* used in Chapter 6 indicates that the statement belongs to participant No.1 from Study B. while the citation *(SCp1*), used also in that chapter, indicates that the quote belongs to participant No.1 from study C.

- Cross-references to other parts of this thesis are indicated with the word “Section” or a section mark (i.e., §), plus the number of the section are indicated (e.g., Section 3.1, or §3.1).

- Bibliographic references are presented in the APA (American Psychological Association) style.

- The book “The Turn” by Ingwersen and Järvelin (2005) is frequently cited, the authors’ names or the book’s title are used occasionally instead of the citation for avoiding repetition.

- The conclusions section at the end of each study (from Chapter 5 to 7) includes numbers (e.g., Conc.C.1) which indicate the study’s number and a consecutive number for the conclusion. These numbers are occasionally used for cross-reference.

Dissemination

Parts of this thesis have been published and disseminated at different venues:

The initial research proposal was accepted for the Doctoral Consortium at the Dublin Core/iPres Joint Conference, Lisbon, 2013. It was published later as:

> Melgar E., L. (2014). Experts' annotation behavior in relation to audiovisual content: a case study of the film domain. *TCDL: Bulletin of IEEE Technical Committee on Digital Libraries (10)* 1. Available at http://www.ieee-tcdl.org/Bulletin/v10n1/papers/melgar.pdf

Chapter 5 (Study A) is based on the paper:

> Melgar E., L; Hildebrand, M.; Boer, V.; Ossenbruggen, J. (Forthcoming, 2015). Time-based tags for fiction movies: Comparing experts to novices using a video labeling game. *Journal of the American Society of Information Science and Technology*.

An abstract with the preliminary findings of Chapter 6 (Study B) was presented at the Digital Humanities Benelux Conference in The Hague, and is available as:

> Melgar E., Liliana (2014). "Understanding film scholars' annotation behavior: Supporting scholarship by enhancing online film annotations". Digital Humanities Conference. Amsterdam University, Antwerp University, Huygens ING and Dutch National Library. The Hague, 12-13 June. Available at: http://www.slideshare.net/DHBenelux/2014-melgar-36704298.

An additional study about the user requirements for the development of a "Demonstrator" to The Netherlands Film Museum (EYE) and about the types of user requests resulted in a report that was used by the software developers in the initial development phase of the demonstrator. Parts of the results were included in a presentation at the FIAT/IFTA World Conference, presented as:

> Waterman, S.; Nispen, A.; Melgar E., L.; Schrier, A. (2014). Collection Eye: optimizing a collection database for researchers. FIAT/IFTA World Conference. Amsterdam, 25 October.

Two papers based on Chapters 3 and 7 (Study C) are in preparation to be submitted for publication (2015) to the Information Research Journal (http://www.informationr.net/ir/).

CHAPTER 1. Introduction

"If moving image archives are to establish a link to the scholars, they may need to look outside of their own cataloging departments for help in capturing content information. New cataloging methods and the prospect of user-created metadata may be the direction in which they will look" (Andreano, 2008. "The missing link").

1.1. Background and context

Boleslaw Matuszewski, a Polish cinematographer working in Paris at the end of the nineteenth century, was one of the first people to realize the historical value of films and the need to recognize them as archival objects. In 1898, only three years after the first film projection by the Lumière Brothers, he wrote a pamphlet proposing the creation of a cinematographic museum, and envisioned ideas such as the legal deposit, the structure of the archive, its exhibition activities, its value for research, and the creation of a film journal to discuss those issues (Matuszewski, 1898). The Library of Congress in the United States received the Edison Kinetoscopic Records in 1893 (for copyright registration purposes) (Jeavons, 2007), but it was not until 1942 that they began to have special staff to acquire, catalog, and provide research access to moving image materials (Library of Congress AMIM Revision Committee, 2000). The first film archives recognized as such emerged in the United States and Europe in the 1930s, when also the first international association, the International Association of Film Archives (FIAF) was created[1].

Despite Matuszewski's timely warnings and visionary ideas, the initiatives above could not prevent most films from the early years being lost[2]. Nowadays, a wide variety of audiovisual archives* exists around the world, ranging from broadcasting archives to film archives* or commercial production archives (King & Gracy, 2009; UNESCO, 2012). Currently, the Association of Moving Image Archivists (AMIA) claims to represent over 750 individuals and institutions from the United States and Canada and around the world; likewise the FIAF association of film archivists, has more than 150 affiliates worldwide to date (Fédération Internationale des Archives du Film, 2015). The task of these memory institutions in collecting, appraising, describing and preserving audio-visual* material is increasingly challenging in an age of visual culture, in which the production of moving images reaches unmanageable rates. For instance, the National Film Archive of the British Film Institute (BFI) states that its collection includes around 180,000 films and 750,000 television titles (British Film Institute, 2015), or the Library of Congress in the United States states that it had more than 100 terabytes in 2008 for just one television show as part of its enormous moving image

[1] A detailed history of film archives is presented for instance by Jeavons (2007).

[2] A report about survival of American silent feature films commissioned to historian and archivist David Pierce by the National Film Preservation Board of the Library of Congress, informs that only 14% of the feature films produced in the United States during the period 1912–1929 survive in their complete released version in 35mm film. Another 11% are complete and survive, but not in their original format (Pierce, 2013).

collection (Library of Congress, 2008). In turn, the current most popular video sharing service on the Web; YouTube(rw), receives over 100 hours of uploads every minute, which is more in a single day than all three major U.S. Networks have broadcasted in the last five years combined (Stewart, 2014)[3]. The number of digital sources has increased not only as a consequence of the changes in production and distribution of documents*, but also due to the growing demand for access to digitized cultural heritage. Indeed, this period in the history of film archiving has been characterized as "the era of access" (Ricci, 2009).

In addition to the difficulties for deciding what are the potential archival moving images* in this landscape, archives face several challenges that demand urgent attention, including the need of preserving the medium (analog and digital) from obsolescence, the urge for digitization, the challenges of digital reformatting, and the barriers imposed by proprietary formats, preservation costs and copyright issues. However, an important step after preservation and other efforts is to facilitate access, otherwise there is a risk of moving images being ignored, invisible or forgotten in enormous masses of audiovisual productions that traditional archives or current information retrieval systems cannot take care of, or provide access to. It is important to take into account, as Turner (1998) has indicated, that from the perspective of the user*[4], the non-findable material is just as inaccessible as the material that has not been preserved. Hence, solutions for providing access to these enormous amounts of information have to be found.

On the one hand, automatic indexing has been suggested as a practical solution for indexing the content of the moving images, being the sole mechanism used by some institutions for providing access to textual documents (Anderson & Pérez-Carballo, 2001b). Automatic multimedia retrieval technologies have rapidly evolved by way of trying to solve the problem of accessing moving images, and they are constantly improving in facilitating retrieval of objects and concepts derived from the images' low-level features. However, to date, they are mostly used in broadcast-related or commercially driven archives (Turner, 2009), as opposed to film archives, and little is known about whether they are used in other settings as well, or whether they could be useful (Sandom & Enser, 2001, p. 141). On the other hand, traditional cataloging practices that emerged from the Library and Information Science (LIS) domain are currently used by information professionals in film and other media archives (Martin, 2001). These practices, however, are time-consuming, and it is not sure whether they can cope with the need to describe content in great detail. Coupled with the inherent limitations of manual indexing, sharing information and data on the web, which archives are highly expected to do nowadays, is difficult and may require alternative approaches to online content description.

Social tagging has been one of the earliest implemented collaborative practices on the web

[3] Oomen et al., 2014 indicate that in 2005, UNESCO estimated that world audiovisual holdings totalled 200 million hours (UNESCO, 2005, as cited in Oomen et al., 2014, p.168).

[4] The term has traditionally been used to refer to a person in the role of "patron", i.e., someone who uses the resources and services of an information system*, generally a library (Reitz, 2013). In this thesis, the term "user" has a specific meaning, and is related to the terms "actor*," and "contributor". These terms are defined in Appendix A (see §Writing conventions).

for describing shared content online. Since in 2005 services like Furl(rw), Flickr(rw), and Del.icio.us(rw) started offering their users* the option to add labels or tags to organize content (Smith, 2007), many websites have incorporated social tagging services, and research has not ceased in discovering new theoretical and practical approaches to this way of indexing digital information. So far, this crowd-driven annotation* technique has proved to be successful not only in increasing the ways for accessing content, but also for engaging users with online collections (van Hooland, Méndez Rodríguez, & Boydens, 2011). Social tagging is a form of *crowdsoucing*, a term coined by Howe (2006), in contrast with the term "outsourcing", meaning that the job traditionally done by a single person hired for doing the work, could be done by several people, often voluntarily, through the web (Howe, 2006, Quinn & Bederson, 2011), as part of the broader phenomena of user-generated content* (UGC). Part of the cultural heritage sector[5] has embraced this practice and is progressively incorporating it as part of their workflows (Oomen & Aroyo, 2011), giving rise to new area called "cultural heritage *crowdsoucing*" (Ridge, 2014)[6]. Initiatives in the audiovisual archival domain, however scarce, have a successful example in the *"Waisda?"* video labeling game project, launched in 2009 by the Netherlands Institute for Sound and Vision, to collect time-based* tags for TV broadcasts and historic newsreels (Gligorov, Hildebrand, van Ossenbruggen, Schreiber, & Aroyo, 2011; Images for the Future, 2009; Oomen, Gligorov, & Hildebrand, 2014). In the film domain, the case of the Estonian and Finish film databases seem to be the only dedicated projects to collect moving image metadata through *crowdsoucing*[7]. Likewise, research about *crowdsoucing* annotations applied to the film domain is scarce, and the project to create a framework applied for the analysis of film and television, by Geisler, Willard, & Ovalle (2011) appears to be the only proposal.

While some of the underlying reasons of the lack of implementation of metadata *crowdsoucing* in the film domain may be related to organizational aspects, curatorial* concerns, the belief that access is only guaranteed if items are digitized, and a relatively slow adoption of metadata standards, the nature of the task of collecting annotations for film material plays a significant role. Indeed, since the proliferation of social tagging in 2005, the focus has moved from the curators and indexing experts to "content*" creators and consumers, the "prosumers" as Toffler (1980) has called them. This corresponds to a new kind of curatorship: broader and participatory (Fossati & Smith, 2012), and to a change in the paradigm of "information consumption" to "curation*" (Whittaker, 2011). This phenomenon brings advantages but also problems associated to the metadata quality control mechanisms. Most researchers agree that the need for quality tags or annotations is one of the main

[5] Libraries, archives, and museums, the so-called "LAM" sector, or the group of "memory institutions"*.

[6] Examples are the "The Commons", the Library of Congress project on using the online photo sharing community Flickr to open and disseminate part of its pictorial collections (Springer et al., 2008), the "Steve museum" social tagging project, which collected a large number of tags that describe artworks (Trant, 2009a), and "Your Paintings Tagger" (Eccles & Greg, 2014).

[7] As part of this thesis'work, a small survey to a sample of audiovisual archives' websites was conducted for the purpose of identifying *crowdsoucing* initiatives in the audiovisual heritage domain, but also to observe whether there was an online catalog, or which services were offered to researchers. A list with the identified *crowdsoucing* initiatives is included in Appendix O.

concerns when opening up the archive to user contributions.

One of the most recent approaches that attempts to solve that issue is an initiative called *nichesourcing* (De Boer, Hildebrand, et al., 2012), which promises to combine the advantages of *crowdsoucing* by involving domain experts in the metadata creation tasks. *Nichesourcing* has been defined as a specific form of human-based computation, and as an extension of *crowdsoucing*, "that harnesses the computational efforts from niche groups rather than the faceless crowd" (De Boer, Hildebrand, et al., 2012).

There is a positive contextual factor in favor of the *nichesourcing* approach. The adoption of digital technologies in the scholarly world (the so-called "digital humanities"[8]) has given rise to a wealth of information systems that support scholars in their research. Simultaneously, these systems enable them to participate in information-annotating activities at different levels, previously reserved for information professionals. Indeed, there is evidence that "digital humanists are motivated annotators" (Walkowski & Barker, 2014). In conjunction with this, efforts are being put into creating research infrastructures for the humanities (e.g., the Digital Research Infrastructure for the Arts and Humanities, DARIAH).

Furthermore, long before *crowdsourcing* emerged, researchers have always strived to find lost images, and to provide interpretation to the works* protected by archives. The link between researchers and the film archives has been fundamental for film scholarship* (§1.5), and film archives are aware of the need to enhance access to through content description as a way to support research (Andreano, 2008). This landscape offers possibilities for *nichesourcing* in the context of film archives, both for engaging expert communities in the indexing tasks, and for improving the quantity and quality of the moving image annotations.

There are several issues to evaluate, both on a conceptual and on a practical level. For instance, at a conceptual level the main question is what is meant by expert content annotations[9], and how they relate to other forms of annotations. Also, the information needs and seeking processes of moving image experts are not well known, thus it is not possible to predict the ways of engaging and the annotation types* that would be produced by the experts, or if they will have further use in their research processes. On a practical level, one prerequisite for *nichesourcing* initiatives to succeed is that the domain experts are willing to participate. They may be difficult to find or they may have limited time available. Additionally, there is no evidence yet that they will participate in online information-annotating activities. On the institutional side, the question of how film archives could implement these initiatives, also considering that a great part of the audiovisual heritage is analog[10], seems crucial.

[8] Current discussions about this concept and its implications are numerous, see for instance Flanders and Mylonas (2009); Berry (2012); Bod (2013).

[9] The concept of annotation will be introduced in the next chapter (§1.2) and in Chapter 2 (§2.2.1), and it will be analyzed more closely in Chapter 3 (§§3.4.1; 3.5) from an Information Behavior (IB) and Information Seeking and Retrieval (IS&R) perspective.

[10] Even though digitization has enormously increased the possibilities for online access, for the way history is written and for the scholarship itself (Burt, 2007), moving images are far from being easily accessible at that level due to copy right restrictions, technical or economic limitations. A recent report by Europeana, one of the major initiatives for

Some of the answers to these questions, from a research angle, will have to come from the LIS and IR disciplines. Indeed, facilitating access to documents of all kinds has been mainly the concern of the Library and Information Sciences (LIS) and Information Retrieval (IR) disciplines, which throughout the course of the history of human culture have been finding solutions to the problem of "bringing searches and information sources together" (Koolen, Kamps, & de Keijzer, 2009). Since the document explosion that started in 1945 (Ingwersen, 1992, p. 2), IR research has refined the mechanism for the creation of indexes on a massive scale. This apparently simple mechanism (the index) supports discovery and makes retrieval possible, however, it is far from being simple to build and far from being a "naïve" instrument[11]. Providing access to moving images is harder than to textual documents, because they use different codes that require a non-linguistic level of interpretation and knowledge from the viewer (Hollink, 2006, p. 1), and are time-based, as opposed to the static or fixed nature of texts or still images. Moving images have been called "a blind medium," since sequential viewing is commonly needed to apprehend the work (Sandom & Enser, 2001), even though current facilities derived from research on automatic indexing are bringing new skimming possibilities.

In addition of being a practical challenge, understanding and implementing *nichesourcing* brings also theoretical concerns. In 1992, Ingwersen suggested that indexing theory was fragmented (Ingwersen, 1992), this fragmentation only seems to have increased afterwards[12], and the task to investigate *nichesourcing* from a theoretical angle also requires attention. This thesis' research problems are thus at two levels: on a practical level, it is an attempt to investigate the annotations types* that experts could contribute to an eventual *nichesourcing* initiative; and on a theoretical level, it aims to explore the fields mentioned above in a quest to find a broader theoretical framework for *nichesourcing*.

In this thesis, several questions are raised in relation to annotating moving images, which are detailed in the next section. Chapter 2 and 3 provide the background and conceptual foundations for *nichesourcing*, while Chapters 5 to 7 present empirical evidence related to the practical concerns.

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access to digitized cultural heritage in Europe, indicates that 90% of Europe's heritage is not yet been digitized (Europeana, 2014, p. 9). However, this thesis assumes that one basic form of facilitating access is through freely accessible metadata, even if the items are not fully accessible for online viewing.

[11] The concept of document, central to LIS research, and the ways in which documents are produced, disseminated and "indexed", have multiple meanings and reflect different historical traditions. Far from being just technical devices, indexes usually entail personal and world views, and are attached to broader societal or economic infrastructures. Day (2014) has critically investigated the roots of the concept of document, from European documentation to present times, analyzing the implications that a seemingly practical act such as indexing entail in the overall social landscape. Otherwise, since the scope of this thesis is limited to investigate solutions to the problems of indexing moving images through a *crowdsoucing*/*nichesourcing* approach, foundational concepts such as "document", "index" or "documentation" are not deeply or critically analyzed from a theoretical perspective, but the reader interested in these necessary critical views can find a deep examination in Day (2014). Basic definitions of these concepts for this thesis' purposes are introduced in Chapter 2.

[12] At thetechnical level, different solutions to the problems involved in moving image access come from different communities and disciplines (e.g., cataloging and classification, content-based automatic information retrieval (CBIR), artificial intelligence (AI), pattern recognition, linguistics, speech technology, computer vision and signal processing, human computation, cognitive science, or web science). Each perspective presents a different view on how to provide access, and on how to facilitate access based on their own theoretical assumptions.

1.2. Problem description and research questions

The initial problem that motivated this thesis was the concern for the lack of social tagging initiatives in the audiovisual heritage sector, and the need for understanding social (time-based) tagging as a new phenomenon in audiovisual indexing, evidenced by the success of the *"Waisda?"* project. Initial explorations led to the understanding that quality of the metadata is one of the biggest concerns, mainly in the context of memory institutions, and thus, the hypothesis that *nichesourcing* would be a more necessary approach became the starting point for the research.

This hypothesis brought the scope to the research problem, also originating the initial research question. As suggested above, one of the prerequisites to implement *crowdsoucing* or *nichesourcing* initiatives in the audiovisual heritage domain is to know what types of tags or annotations could be obtained or are needed, which content aspects of the moving images they should address, and which semantic features they should represent. In addition, there is also a need to find out whether the domain experts would be willing to contribute to such initiatives. Hence, out of the several possibilities for researching *nichesourcing* within the broad context presented in the previous section, this thesis work focuses on two aspects: (1) the types of annotations (and their semantic attributes) that could be obtained from a niche group (experts in the domain of film and media in this case), and (2), on understanding the information needs, and seeking and searching behaviors of this group, in order to conclude what the role of the different types of annotations in supporting their expert tasks would be.

In order to delimit the specific research problem addressed in this thesis, it is important to define what *crowdsoucing* and *nichesourcing* mean in this thesis, besides other important key concepts:

There is no commonly accepted definition of ***crowdsoucing*** to date, up to the point that the inconsistencies in the use of the term have been identified as one of the factors impeding a project's success (Noordegraaf, Bartholomew, Eveleigh, Proctor, & Cherry, 2014). A commonly accepted characteristic, is that "*crowdsoucing* replaces traditional human workers with members of the public" (Quinn & Bederson, 2011). Hence, the possible applications of this replacement cover several areas in the context of a collaborative economy. In the cultural heritage sector, "the cultural heritage *crowdsoucing*" area as named by Ridge (2014), most initiatives can be classified in the types proposed initially by Oomen and Aroyo (2011), presented in Table 1.1.

Table 1.1. Classification of crowdsoucing initiatives (Oomen & Aroyo, 2011; Oomen et al., 2014, p. 163)

Type	Description
Correction and transcription tasks	Inviting users to correct and/or transcribe outputs of digitization processes
Contextualization	Adding contextual knowledge to objects, e.g., by telling stories or writing articles/wiki pages with contextual data
Complementing a collection	Assembling additional objects to be included in a (web) exhibit or collection; pursuit of additional objects
Classification	Gathering descriptive metadata related to objects in a collection. Social tagging is a well-known example
Co-curation	Using inspiration/expertise of non-professional curators to create (web) exhibits
Crowdfunding	Collective cooperation of people who pool their money and other resources together to support efforts initiated by others

The initiatives in the "classification" type are associated with knowledge organization problems which have been the concern of the LIS and IR disciplines, and of the curatorial* work of memory institutions*. Those problems include the creation of indexes that facilitate source retrieval and discovery. Other common terms to refer to these indexes are "metadata" and "**annotation**". These concepts are discussed later in this thesis, but for this introduction the most important clarification is that the term "annotation"[13] will be preferred, in order to encompass a great variety of descriptions.

Nichesourcing was defined by the proponents of the initiative as a specific type of *crowdsoucing*, a "natural step" in its evolution, where complex, knowledge-intensive tasks that require quality are distributed amongst niches of experts rather than to the "faceless" crowd (De Boer, Hildebrand, et al., 2012). The two initial projects that are identified as cases of *nichesourcing* (Boer et al., 2012), addressed problems, according to the types in Table 1.1, related to: "classification" (i.e., "The Rijksmuseum prints annotation" project); and, "transcription" (i.e., a digitization related project, part of a bigger effort for regreening in Africa)[14]. De Boer et al., (2012) explain that *crowdsoucing* and *nichesourcing* differ in three aspects: (1) the type of task (i.e., "the atomic task"), and whether it requires or not domain knowledge to be performed, (2) the "resource pool", which is the type of group (crowd vs. niche or community of practice) that could perform the tasks; and, (3) "product", referring to

[13] In Library and Information Science (LIS), which is the discipline that gives the roots to this thesis, this term is not commonly accepted. Instead, the term "indexing" is at the core of the discipline. Lancaster (2003), one of the most important theoreticians in the field, indicates that the term "annotation" is "inexcusably misleading" (p.101). Even so, this thesis attempts to investigate how a broader perspective of the concept of indexing conveyed by the term "annotation" could be beneficial for moving images. These terms are briefly defined in Chapter 2 (§2.2.1), and in Chapter 3, where the uses of the term "annotation" is analyzed more in detail.

[14] The concept of *nichesourcing* and related projects are discussed later in this thesis (§§2.5,2.6).

whether the success of the output is determined by quantity or quality.

The two aspects mentioned above (the type of task and the resource pool), connect to the concept of **expert** that is of importance in this thesis. It can be anticipated that there are two basic types of expertise involved in moving image annotation: indexing expertise and domain expertise. There are several areas in which domain expertise about moving images exists. In the academic setting, film and media is one of the most related (§1.5).

Finally, one key concept to this thesis is **moving image***, which access and description problems motivate the investigation. This concept, widely used by the community of film and media scholars and archivists, will be introduced in Chapter 2, where it is indicated that it is basically used in this thesis in a broader sense, as a way to encompass a wide range of media works*.

In sum, this thesis' research problem is about:

- Cultural heritage *crowdsoucing*, more specifically, about *crowdsoucing* in the audiovisual or moving image heritage domain; also about
- *Nichesourcing*, in the sense that it investigates the contributions by domain experts, more specifically of film and media scholars; and about
- "Classification", from now on called "annotation," since social tagging is listed as "classification" in Table 1.1.

Subsequently, seeking brevity, these three aspects above will be implicit in the term *nichesourcing*, every time it used in this thesis, otherwise explicitly stated, since the necessary phrase to encompass them would be lengthy: *Cultural heritage expert crowdsoucing (or cultural heritage nichesourcing) for annotation tasks in the audiovisual heritage domain*. The definition of the term itself will be adjusted based on this thesis findings, and be introduced in the last chapter.

On a methodological side, the possibilities to investigate a research problem within the framework of the LIS discipline; underlying this thesis work, suggests two approaches. According to Saracevic (2009) one approach is to focus on people and social context in relation to information use and needs, which is called "human information behavior" (HIB), or simply "information behavior" (IB). Another approach is to focus on the techniques, systems, and technologies, which comes under the name "information retrieval" (IR). The choice in this thesis, based on the nature of the problem described above and the background of the researcher[15] is to address the research problem from the first perspective.

Taking this into account, even though the main trigger for this investigation is *nichesourcing*, the work does not delve into the technology requirements needed to set up any specific *nichesourcing* or human computation system. Instead, this thesis explores information annotating-related behaviors (such as tagging) and the general information behavior of domain experts, which can inform or inspire future design of systems or infrastructures that

[15] The broad "domain knowledge" of the researcher is LIS, not specialized in IR system design or evaluation.

can support them.

Indeed, studies about the information needs and seeking behavior of groups of people (film and media scholars in this particular case) can provide input to better system design (Ingwersen & Pejtersen, 1986), for improving service provision (Naumer & Fisher, 2009), or for assisting the development of research infrastructures that in turn support researchers and scholarship (Benardou, Constantopoulos, Dallas, & Gavrilis, 2010). Ingwersen & Järvelin (2005) state that, "if we can establish properties of information needs we are better capable of designing [information seeking and retrieval] environments that may act on such properties during interaction with natural work and search tasks" (p.290). At a more general level, this understanding would contribute to the general knowledge of how humans; in this case film and media researchers deal with information.

However, as Kirkegaard and Borlund (2008) identified, the investigation of users' needs for audiovisual information objects is a relatively recent topic in the research literature (p.117). As late as 2008, Enser (2008a) pointed out the lack of studies in moving image search behavior, a lack that Fidel (1997) had already observed in the late nineties in relation to the limited research on user issues and a lack of theoretical background for the design and evaluation of image databases. Additionally, to date, existing IB models have mainly focused on seeking and searching, but hardly on information use, and even less on information annotating-related behaviors (this topic will be discussed in Chapter 3).

This thesis is guided by three broad **research questions**, presented in Table 1.2. Each question guided the design of three separate, although interconnected studies (i.e., Study A, B, and C). These are in the third row in that table, and are explained in Sections 1.4 and 1.7. The broad research questions are:

RQ1. *What characterizes film experts and scholars' tagging behavior and their attitudes towards tagging moving images? Are there differences and/or similarities between film domain experts and novices in their tagging behavior? Moreover, if so, what are these similarities and/or differences?*

This question investigates the issue of "**tagging behavior**" (as it is conceptualized in Section 3.5.3). According to Tsai et al., "Unlike metadata assigned by authors, or by professional indexers in libraries, each end user's tags reflect that end user's personal understanding of the content" (Tsai, Hwang, & Tang, 2011, p. 272). Questions arise about whether film experts reflect their domain-specific knowledge in the tagging process, and on how their tags compare with those of domain novices and indexing experts or to what extent a model for moving image analysis can guide the tagging process. The main research problem, and these issues influenced the first research questions. Among them, the first thesis' study (Study A), was designed to explore the kinds of tags for films that are created by domain experts, and if a social tagging setting could be used for films.

RQ2. *What characterizes film and media scholars' information-annotating behavior in relation*

to moving images? How would scholars perform information-annotating tasks intended to serve future retrieval purposes, and what are their attitudes towards these shared annotations?

This question was motivated by the need to identify the different "**scholarly annotating behaviors**", as conceptualized in Section 3.5.4, and of different types of annotating behaviors in a broader sense (as conceptualized in Section 3.5.1). The findings from the previous study (Study A) supported the need to further explore additional annotation types* (i.e., additional forms of adding descriptions, not only tags) and practices in the film and audiovisual scholarly world in relation to annotating moving images. An additional aim is to understand if annotating for personal use differs from annotation with the purpose of future retrieval by others.

RQ3. *How do film and media scholars seek and search moving images? What are the most prominent information needs, seeking and searching processes, and what types of annotations support them while seeking moving images for research-related tasks?*

This question relates to the issue of "**information needs and seeking behavior**" as it is conceptualized in Sections 3.2 and 7.3.2. After the previous examinations, it became evident that a key aspect for understanding tagging and annotating behavior was the observation of search behavior. Even though moving image indexing is an active research area, research about film and media scholars' information needs and seeking behavior is scarce. Various authors have recognized the lack of knowledge about the way users search for images (Choi and Rasmussen, 2002; Fidel, 1997, among others, as cited in Hollink, 2006, p.9). Taking this question into consideration, the aim was to find evidence for characterizing the main information needs, sources of information, and motivations of film scholars* when they seek films and moving images for research purposes. This broader context is expected to provide a better basis for understanding which types of annotations support film and media scholarship*.

Table 1.2. Summary of research problem and research questions

RESEARCH PROBLEM. Several perspectives provide solutions to the problems of moving image access. *Nichesourcing* (De Boer, Hildebrand, et al., 2012), is a novel initiative that has been applied to the visual domain. Several issues could be investigated. This thesis seeks to understand whether this type of *crowdsoucing* in which niches of experts provide high-quality annotations could improve the quality of the moving image annotations, and whether it could be considered as an option for film archives both to engage expert communities (more specifically film and media scholars) and to increase the amount and quality of their metadata. Two aspects of the research problem are investigated: the types of annotations that could be expected from niche groups; and the broader context of use of those *nichesourced* annotations, as well as the role that different types of annotations have in supporting moving image-seeking processes during research and teaching-related tasks.		
Theoretical framework		
RQ1. What characterizes film experts and scholars' tagging behavior and their attitudes towards tagging moving images? Are there differences and/or similarities between film domain experts and novices in their tagging behavior? Moreover, if so, what are these similarities and/or differences?	***RQ2***. What characterizes film and media scholars' information-annotating behavior in relation to moving images? How would scholars perform information-annotating tasks intended to serve future retrieval purposes, and what are their attitudes towards these shared annotations?	***RQ3***. How do film and media scholars seek and search moving images? What are the most prominent information needs, seeking and searching processes, and what types of annotations support them while seeking moving images for research-related tasks?
Study A	**Study B**	**Study C**
RQ1.1.How do film experts tag films compared to domain novices? Do film experts, as opposed to domain novices, reflect their domain specific knowledge when tagging film content? ***RQ1.2***. Can we influence the type of time-based tags that users enter with specific instructions based on conceptual frameworks? ***RQ1.3***. What are the attitudes and perceptions of scholars and professionals towards tagging games? How to characterize their game tagging behavior?	***RQ2.1***. What types of annotations are used by film scholars when assigned a moving image-annotating task for the purpose of future retrieval? ***RQ2.2***. Which attributes of the moving images are most relevant for film scholars when performing a describing task? ***RQ2.3***. What are the attitudes and perceptions of scholars towards their information-annotating behavior, and towards shared annotations?	***RQ3.1***. What are the most significant characteristics of the film and media scholars' research areas and research behavior in relation to topic selection? ***RQ3.2***. What kinds of sources are used by film and media scholars and what are the most significant characteristics of their methods for collecting and analyzing them? ***RQ3.3***. What are the most significant characteristics of film scholars' information needs and seeking processes for moving images in relation to their research and teaching tasks? ***RQ3.4***. Are there particular patterns in film scholars' search behavior? What kind of information systems do they use, and how?

1.3. Aims and objectives of the thesis

The main aim of this thesis is to offer theoretical foundations and empirical evidence for future research and implementation of metadata *nichesourcing* and *crowdsoucing* initiatives in the moving image domain, mainly in the cultural heritage sector and in audiovisual archives* which intend to support research and scholarship by involving domain experts as annotators. This is inspired by the broader aim of improving access and dissemination of audiovisual heritage, and of contributing to IB research. Accordingly, the main objectives are:

(1) To identify the main current problems for indexing moving images and the different solutions proposed by diverse disciplines or perspectives, focusing on the solutions and problems presented by the *nichesourcing* perspective.

(2) To understand the place in the framework of LIS research of the main information-related behaviors in which people with different knowledge backgrounds and indexing experience provide informational input or communicate with others in the form of annotations.

(3) To reach empirical insights on the types of annotations (in terms of form or style and semantic categories) preferred by domain experts when they annotate moving images.

(4) To identify the types of annotations that are required to support the information needs and seeking behavior characteristics of film and media scholars in the context of their academic activities.

(5) To provide theoretical foundations and empirical evidence for the investigation of moving image experts' interactions when using audiovisual sources.

1.4. Methodology outline

This section summarizes the methodological aspects that will be detailed in Chapter 4. This thesis is a case study of domain experts. The domain under investigation is film and media scholarship, more specifically; film and media scholars. The rationale behind this choice is explained in the next section.

Each research question presented above (§1.2) was used as a guide for the design of three individual but interconnected studies. Using a "mixed-methodology" approach (a combination of qualitative and quantitative methodologies) (Pickard and Childs, 2013), and the case study method, these questions and studies emerged throughout the research process and in iteration with the refinement of the initial theoretical framework. Table 1.3 summarizes the research design and the order in which the studies are shown reflects that succession.

Table 1.3. Methodology outline: research design and methods.

RQs	Study code	Study Title	Theoretical framework	Methodology	Method	Participants (actors*)	Data collection techniques	Research instruments	Data analysis procedures
RQ1	A	Film experts' tagging behavior of moving images: comparing experts to novices using a video labeling game	Tagging behavior (§3.5.3)	Quantitative	Experimental research	Domain experts (film and media experts: scholars and professionals from different countries) Domain novices	A tagging system	Video labeling game and questionnaire (§5.4)	Tag analysis (high level, categorical analysis) + Questionnaire coding
RQ2	B	Film scholars' annotating behavior in relation to moving images: a case study	Information-annotating behavior (§3.5 and §3.5.4)	Mixed methodology	Case study	Domain experts film scholars from different universities in Madrid, Spain)	Focused, in-depth interview (includes a work session based on simulated work tasks situations)	Session protocol (§6.4)	-Qualitative analysis (coding) -Quantitative analyses
RQ3	C	Film and media scholars' information needs, seeking and search behavior: a case study with emphasis on annotations that support research	Information behavior (IB) (§3.2, and §7.3)	Qualitative	Case study	Domain experts (film and media scholars from a university media studies department in Utrecht, The Netherlands)	Focused, in-depth interview	Interview guide (§7.5)	Qualitative analysis (coding)

1.5. Scope of the case study: the domain of film and media scholarship

As explained in the previous section, this thesis is a case study about expert moving image annotations, focused on a group of domain experts, namely film and media scholars. In this way, the boundaries of the case study are given by a specific academic domain. The rationale behind this choice is that this is a group of domain experts that analyzes and makes intensive use of moving images.

Other approaches, such as studying the potential niche of humanities scholars using audiovisual sources has not been used since, as Must's (2012) indicates; humanities researchers do not constitute a homogeneous category. Additional possibilities existed for selecting different smaller groups who use moving images intensively; for instance, historians, professional footage searchers or "film researchers*," filmmaking educators, etc. However, since one of the general aims of this thesis is to investigate how audiovisual archives can enhance their support to researchers, the aforementioned domain was selected for being in closer connection with a specific type of archive, namely, film archives. Also, these archives appear to be more supportive to research activities than other archives in the audiovisual domain. Nevertheless, the implications derived from the study aim to have a wider theoretical and practical application. The methodological aspects of this choice are also introduced in Section 4.5. The remaining of this section introduces the case study by highlighting the main characteristics of this academic domain and presenting working definitions of its main research perspectives, which are used throughout this thesis, especially in Chapter 7. Appendix K presents a more detailed introductory description of this discipline.

The field of **film studies** is understood to be devoted to the study of films* and cinema*. Film studies is a discipline within the performing arts area in the humanities, together with theater, music, radio, dance, television, and animation (Aversa, 2012, p. 241). It is devoted to the scholarly study of cinema, film, and films (Kuhn & Westwell, 2014c). The term itself is recent, while other terms such as "film appreciation", "cinema studies", or "screen studies" have also been used to refer to the study of films (Casey B. & Mortimer, 2013, p. 13)[16].

Although the idea that film is but one of the several media* had already been pointed out in the 1920's, the term **media studies** seem to be more recent. Media studies denotes a stronger emphasis on the different systems of communication or entertainment, of which film is only one. The term "media studies" alone is usually used interchangeably with "mass communication", but there is no established definition of the fields of **communication and media studies**.

The composed term "**film and media**" is adopted in this thesis to refer to these areas together. It does not mean that this thesis chooses both film studies and media studies as cases, but that both film and media* are considered as one single phenomenon that is

[16] A brief summary of the history of film and media studies is included in Appendix B.

studied by the selected sample of scholars. Occasionally, the term "film scholar" is used instead of "film and media" scholar. This has the purpose of abbreviation, or also to denote that there is a stronger emphasis on the study of films than in other media, or in films as one type of media work*. Additionally, similarly to Kirkegaard (2009), the focus of this thesis is on film and media studies as a humanities-based discipline.

Currently, the most common epistemological divisions of film studies include: (1) the biographical and aesthetic focus, which includes formal and neo-formal approaches, (2) the sociological perspective, and (3) the new film history approach (Kuhn & Westwell, 2014e). These epistemological divisions will be revisited and re-defined from an IB perspective in Section 7.6.1.

The relation between film archives* and scholars is a subject of study in current scholarship (see for instance Bessière & Gili, 2004; Fossati, 2009). Well-founded is the statement by Albera (2004) that the link between film and media scholars and archivists has even caused an epistemological revolution in film history, more specifically in the case of early cinema research. However, Fossati (2009) indicates that, "compared to art restoration and to the academic reflections around it, film restoration and media studies have never been closely related" (p.105). These aspects are essential to understand the organizational and contextual issues in which the *nichesourcing* initiative would integrate. However, it is not within the scope of this thesis to study them in detail. Instead, this work focuses on one of the aspects of the problem, which are the issues related to knowledge organization and indexing, as clarified in Section 1.2.

1.6. Thesis' main contributions and limitations

Overall, this thesis is mainly exploratory and descriptive, one in which no causal relationships are sought, and it does not account for key specific issues that lead to concrete requirements for information system design. Answering the thesis' research questions will provide, to the best of our knowledge, the following evidence-based input to the LIS and IB fields:

(1). From a theoretical perspective this thesis contributes to the field of information behavior (IB):

- By contributing to previous research on information annotating phenomena from a holistic perspective, proposing ways for achieving that perspective in moving image retrieval research, and in current IB models and research areas.
- By applying a specific macro-model of IB and IR research, the Integrated Information Seeking and Retrieval framework (IS&R) by Ingwersen and Järvelin (2005), for the purpose of guiding the research design of information-annotating behavior studies as conceptualized in this thesis.
- By proposing ways for applying the concept of "polyrepresentation" Ingwersen (1992, 1996) to the study and creation of representations in the media domain.

(2). From an empirical perspective, this thesis contributes:

- To an updated and comprehensive overview of the different perspectives in moving image annotation, and the placement of *nichsourcing* within them.
- To the knowledge about indexing, abstracting, and time-based tagging applied to films.
- To the knowledge about the information needs, information seeking, search and annotating behavior research on a specific group of humanities scholars: film and media scholars.

The thesis' theoretical contributions have at the same time some limitations. Each study (Chapter 5 to 7) states its respective limitations, and the limitations of the theoretical framework are also outlined in Section 3.6.2. The main limitation originates from the fact that it is a case study of groups of scholars in a given domain. Case studies are not intended to produce generalizations, contrarily; this method is intended to allow for "transferability of findings based on contextual applicability" (Pickard and Childs, 2013, p.109).

Consequently, the context of potential application is audio-visual heritage archives, in the design of information services that support research in the context of collaborative projects with interdisciplinary teams that involve film and media scholars, or humanists making use of audiovisual media.

Finally, it is not within the scope of this thesis to offer theoretical contributions to film scholarship, although Chapter 7 can be of interest for researchers concerned with observing the IB perspective about their discipline and areas of study.

1.7. Thesis outline

This thesis is composed of eight chapters. Figure 1.1 indicates the topics and chapter numbers. Section 1.2 summarized the research questions (Table 1.2), and Section 1.4 the research methods (Table 1.3).

After this introductory section, **Chapter 2** introduces the main perspectives on moving image annotation. It constitutes the research background and provides the preliminary basis for understanding the need for expert content annotations. It also provides the basis to select a theoretical framework.

Next, the theoretical framework is exposed in **Chapter 3**. As indicated previously, this thesis is rooted in the LIS tradition, more specifically in IB studies. The main concepts related to these disciplines are explained in this chapter as part of the research approach. Also, Chapter 3 establishes the epistemological basis that bring some of the theoretical contributions of this work. This is done by presenting a proposal for extending Ingwersen & Järvelin's (2005) "Information Seeking and Retrieval Framework" (IS&R) to cover the study information-annotating behavior, and to guide this research. This chapter also introduces a proposal for extending the area of information use behavior studies in order to include annotating behavior.

After that, the methodology, methods, and research design, which were briefly introduced in section 1.4, are detailed in **Chapter 4**. It describes the methodology, research design, and case study method and briefly introduces the specific methods used for each thesis' study. Chapters 5 to 7 correspond to three individual studies, and each one can be read independently.

Chapter 5 reports on Study A, a small-scale experiment in which a video labeling game was applied to study tagging behavior of film experts. The study focuses on the differences in the type of time-based tags between experts and novices for film clips in a *crowdsoucing* setting. The study had thirty-six participants, including film scholars and professionals from different parts of the world.

Chapter 6 corresponds to Study B, a case study of film and media scholars' information-annotating behavior. It uses "simulated work tasks situations" (Borlund & Ingwersen, 1997) as one of the strategies for data collection. The study included ten film scholars from different universities in Spain. It focuses on different styles of annotations (not only tags) and relates them to the concept of "metatexts" used in literary interpretation studies. This chapter also includes a discussion about the use of the concept of "polyrepresentation" in moving images annotation.

Chapter 7 presents Study C, a case study of film and media scholars' information needs and seeking behavior. These aspects provide the context for observing the types of annotations that support moving image-seeking processes during research and teaching-related tasks. The study relied upon the participation of fourteen scholars from the media studies department at Utrecht University in The Netherlands.

Finally, **Chapter 8** offers the summary and the conclusions to the main research questions and discusses the implications both for theory and practice. It also underlines the main contributions, and recommendations for future work.

The intended audiences for the outcomes of this research, as suggested above, are the following: information behavior scholars, information professionals working at film and media archives, and information system designers working with groups of humanities scholars and/or more specifically with film and media scholars or groups of scholars which use moving images.

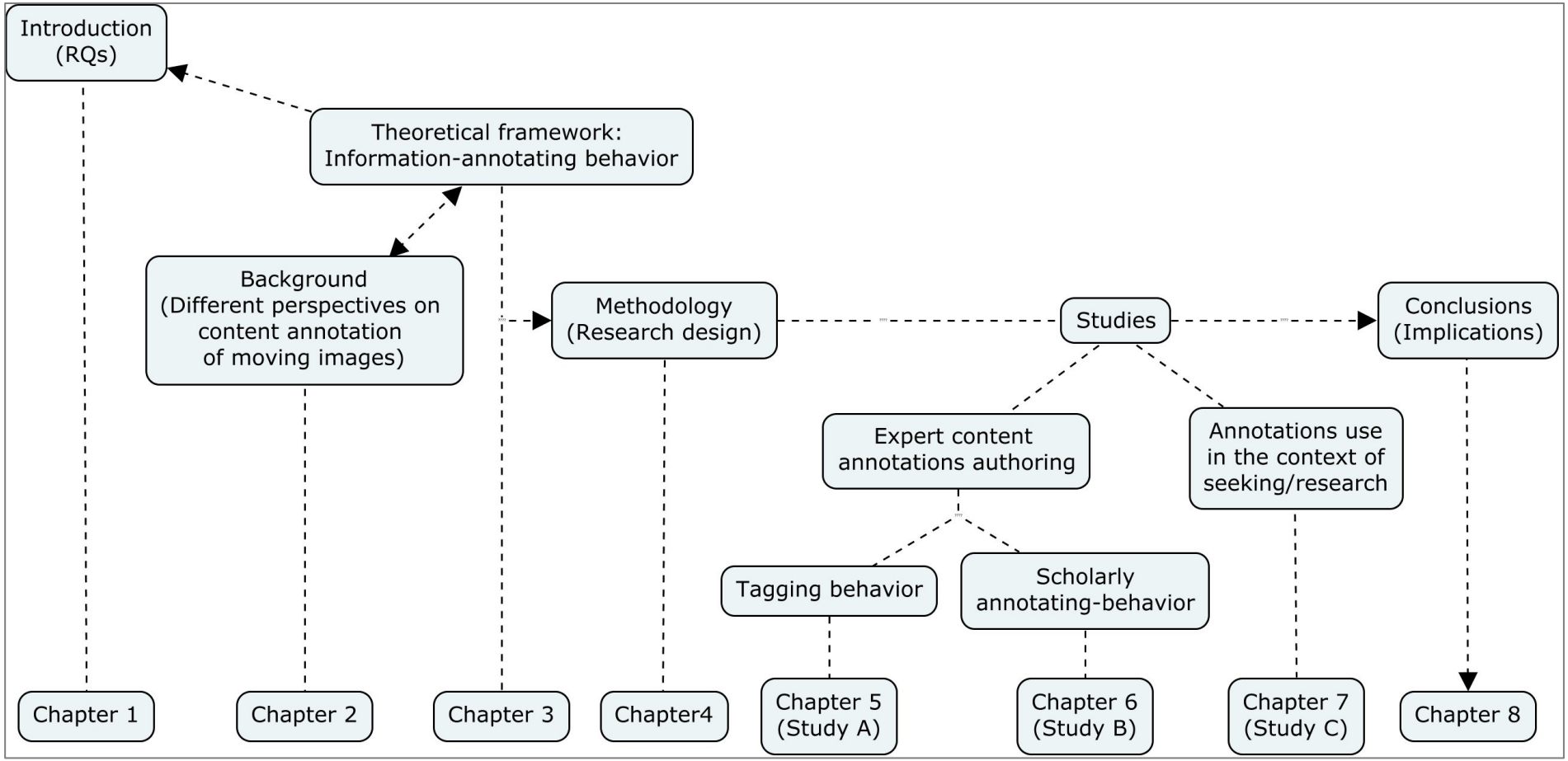

Figure 1.1. Thesis outline.

CHAPTER 2. Background Research: Perspectives in Moving Images Annotation

"We have to get rid of the idea that there's a best way of organizing the world."
(Weinberger, 2008)

2.1. Chapter overview

As it was suggested in the introduction to this thesis' research problem (§1.2), content description of moving images is a challenging endeavor, but necessary to enhance use and discovery possibilities. Even though the access mechanisms at the content level of textual (digital) information have achieved high levels of efficacy, in the realm of moving image archiving this cannot be taken for granted. In the "Moving image" journal, an important publication for film archivists, Andreano (2008) claimed that content description should be considered as a way of providing a link between scholars and archives, validating the fact that, in film archives, this is still a major problem[17].

This chapter presents a comprehensive (although not exhaustive) literature review on the different perspectives that provide solutions to the problems of moving image (content) annotation and access, in order to identify the context in which expert annotations are generated. It aims at describing the scenario (i.e., the research and practice background) in which the *nichesourcing* perspective that motivates this thesis appears.

Section 2.2 introduces the main concepts and problems of moving image indexing. After that, the chapter is structured according to different perspectives. These are described separately for presentation purposes, but they are not mutually exclusive, and may coexist in practice.

Section 2.3 covers information professionals' annotations and standards, involving manual cataloging and indexing. Subsequently, Section 2.4 discusses automatically extracted annotations, including automatic indexing via indexing algorithms. Section 2.5 covers the annotations by non-information professionals*, including tagging and commenting. Next, Section 2.6 discusses semi-automatic annotations in human computational settings. In Section 2.7, annotations by the creators of the media works, including their document structures and notes, are introduced. Section 2.8 covers annotations for media works created in research and education settings (the researchers' perspective, including coding or annotating tasks for personal or group use, and the creation of models for performing image analysis). Finally Section 2.9 presents a conclusion in relation to: the grouping of the identified perspectives into three broad types, and the efforts by the standardization bodies that attempt to guarantee metadata interoperability between them.

[17] "If anything is "to be expected" of the scholars in the future, it is imperative that content description not be written off as impossible but considered seriously as a means of providing a vital link between scholars and archives and included in any future discussion concerning moving image cataloging strategies" (Andreano 2008, p.85).

The emphasis of this section is to identify: (1) how each perspective tackles the issues of creating/generating descriptions, annotations, or metadata that enables subsequent access, and the mechanisms that enable human input; (2) which types of expertise are required by those people/systems who create the annotations; and, (3) what the most relevant research and current standards are for moving image annotation from each perspective, if applicable.

The chapter ends with a general conclusion (§2.9) about domain and indexing expertise, which facilitates grouping the aforementioned perspectives.

2.2. Introduction

2.2.1. Basic concepts: moving images, metadata, and annotations

This section briefly presents basic definitions for the main concepts used in this chapter. A brief introduction to some of those concepts was provided in the thesis' problem description (§1.2).

The first and most essential concept is that of "document*" since moving images fall under this concept. In this thesis, by adopting the notion of **document** as "meaningful signs in relation to other signs […] linguistic or otherwise" (Day, 2014a, p. 5), it would be possible to differentiate between types of documents by their composition: verbal or textual signs, and visual or audiovisual signs. There is no agreed taxonomy of non-textual documents or information, and definitions are often unspecified in the literature on the subject. Exceptions are Layne (1994), who uses the term "visual information" as opposite to "textual information"; or Neal (2012), names with the term "non-text information" a wide scope of "objects that do not communicate using words as their native language" (p.1). Non-text documents include still images*, sound recordings, audiovisual*, multimedia documents*, or moving images. Documents have been usually regarded as composed of "form" and "**content**". Even though this is subject to debate in art history and philosophy, where it is commonly agreed that such separation is not possible, on the LIS side, this distinction is more common, and is widely accepted as a requirement for facilitating access (§2.2.2). (See also Hjørland, 2006).

The term **moving images** is widely used by the community of film and media scholars and archivists. Hence, it is consequently adopted in this thesis[18]. But there is no agreed definition of this term either. Instead, theoretical discussions about the concepts of film*, cinema*, media*, or moving images, are an inherent part of what constitutes film and media scholarship[19]. Because it is not the aim of this thesis to contribute to theoretical discussions at this level, the term "moving image" is basically assumed to include those documents in which

[18] Occasionally, the other referred terms are used. Definitions are included in Appendix A.

[19] See for example the essay by Carroll (1996, part 1, Chapter 4), about the concept of "moving image", which is not an essentialist definition in the philosophical sense (p.71), but an extensive discussion about the problem of "medium essentialism", and the five necessary (although not essential or prescriptive) conditions for the phenomena called "moving images".

the signs are a combination of visual and audio elements, where there is a temporal dimension essential to the composition of the message.

The term “moving image” is commonly used by the aforementioned communities to refer to both film* and television as media (regardless of the format in which they are presented or accessed), and also to certain forms of new digital media. Thus, the term “film” is used, not to refer to the specific celluloid medium, but to denote the kinds of documents in which movement is an inherent characteristic. As Carroll (1996) indicates: “Film belongs to the class of things where movement is a technical possibility, while paintings, slides and the like belong to a class of things that are, by definition, still”. In that sense, the term “film” is used in this thesis as equivalent to the terms ‘media work’*, ‘motion picture’*, ‘audiovisual’* source/document, or ‘movie’*.

The collection and curation* of non-textual documents has historically received less attention than that of textual documents (Turner, 2009). Thus, a great variety of documents which escaped most accepted forms such as books or journals, have being preserved and organized by several types of different institutions, including museums, archives, studios, or also libraries (Hernández, 2011; Turner, 2009). The official acknowledgment of audiovisual documents and their corresponding archives as historical sources is relatively recent, approximately from the 1970´s when the European Council approved a recommendation inviting the member states to preserve their audiovisual heritage (Hernández, 2011). Indeed, Turner, Hudon, & Devin (2002) found that twelve of the fourteen institutions analyzed in their study were less than 50 years old. For that reason, the methods for providing access to moving images are relatively undeveloped compared to the textual counterparts, and the institutions curating them can be generally characterized by using ad hoc organization mechanisms (Turner, 2009; Turner et al., 2002).

One of the central mechanisms used to provide access to documents of all kinds are **indexes**, such as back-of-the-book indexes. Traditionally, in Day’s (2014, p.5) terms, indexes are explicit professional structures that play the role of mediating between users and documents. An index is a manually or automatically created instrument that facilitates access to specific parts within a document where a specific piece of information is located or treated as a subject. This is done by means of lists of words or headings that point the reader to specific parts of the content where those words (or concepts, or topics) appear. The pointers that refer from the index to the specific parts of a document are called “locators” (Weinberg, 2009). Locators can be the same words within the text to be retrieved (i.e., its content), extracted by different means (usually called ‘keywords’); or they can also be concepts assigned or derived from the texts based on what the passages are about (called ‘topics’ or ‘subjects’). When the concepts are derived, they usually are drawn from some form of controlled vocabulary (e.g., a thesaurus) (Lancaster, 2003). In that sense, as Weinberg (2009) states, an index “leads from a known order of symbols to an unknown order of information”.

In this chapter also the term “**annotation**” is used. In Library and Information Science (LIS), which is the discipline that gives the roots to this thesis, this term is not commonly accepted.

Instead, the term “indexing” is at the core of the discipline. Lancaster (2003), one of the most important theoreticians in the field, indicates that the term “annotation” is “inexcusably misleading” (p.101). Even so, the term is commonly accepted in different disciplines, and thus is adopted in this thesis, since it is considered beneficial for providing a broader framework to the solutions for moving image access. This concept will be analyzed in Chapter 3 (§3.4.1), but for the moment it is assumed to be a synonym of indexing, or with “description” of information, or a form of creating metadata.

In turn, the term “**metadata**”, which originally comes from the computer science domain (Caplan, 2003), is used nowadays to refer to any type of data (or information) that describes another piece of data or information resource at a higher level (Greenberg, 2009). In that sense, indexes would be one type of metadata. But in this thesis, more specifically, the term metadata is used in two ways:

(1) In a narrow sense, only applicable to data that describes digital information or objects, which is automatically generated. This meaning is used in this chapter (§2.4), and

(2) In a broader sense, as an equivalent for the term “annotation”, or as “data that defines and describes other data” (International Organizational for Standardization, 2013). This equivalence will be explained in Chapter 3 (§3.4.1), where the term annotating, will be used to refer to any form of metadata creation. In that sense, “annotating”, or “annotation”, is considered as a broader concept than that of index, since it includes other ways of facilitating the access to documents and their content.

In some cases, the term “content indexing” is used, but the term “indexing” mostly refers to content, and thus the expression seems redundant. Also, content-related metadata can be understood as a specific type of metadata. Marchionini and White (2007) use the concept of “**surrogate**” for this type of information, which often includes textual data such as keywords and abstracts. Similarly to the distinction presented above, Marchionini and White distinguish this concept from that of “metadata” in that surrogates “are designed to assist people to make sense of information objects without fully engaging the primary object, whereas metadata can serve this purpose but more often is meant to support retrieval and often is meant to be used by machines rather than people” (p.220).

Annotations are created in different ways. One of the factors involved in the annotation creation process is **expertise**, which basically includes two dimensions: indexing and domain expertise. This issue will be discussed at the end of the chapter (§2.9). The next section presents the different levels at which moving images can be notated.

2.2.2. Annotation levels

The previous section defined the concept of moving images, and that of annotation and metadata. In general, media works can be described or annotated at different levels, ranging from the fonds or collection level to the individual frames composing a shot. Turner (2009) proposes a hierarchy of access levels to moving images, using the RAD (Rules for Archival

Description) in combination with his proposed additional levels. Figure 2.1 shows Turner's hierarchy of moving image description.

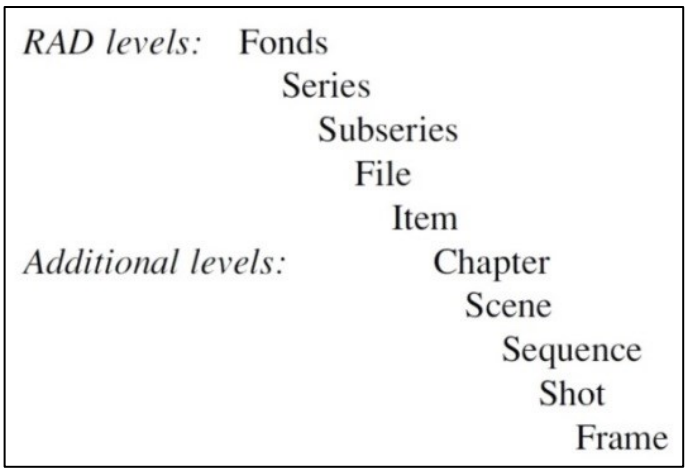

Figure 2.1. Turner's (2009) annotation and access's levels to moving images. Adapted by Turner from the Rules for Archival Description (RAD).

The additional levels proposed by Turner, from the chapter level onwards until the shot level, are often called "time-based" descriptions or metadata, also named as "time-coded metadata", or "strata" by Troncy, Huet, & Schenk (2011, p. 7), which is the information related to a specific time frame within the moving image sequences. Descriptions at the frame level may fall in the domain of visual indexing. There is a gap on research about time-based annotations, which has been identified for instance in Ballan, Bertini, Del Bimbo, Meoni, & Serra (2010; 2011); or Li et al. (2011).

In general, content description at any of the aforementioned levels can be done at different semantic levels, which range from identifying: (1) what the movie or the scenes are "of", and/or (2) what they are "about", i.e., the so-called "ofness" level to the "aboutness" levels. The first one corresponds to a first level of concepts that can be derived from words or features actually occurring in the documents (e.g., a person, a place, or a thing). On the other hand, "aboutness" refers to the topics or themes that are expressed in addition to the concrete elements depicted in the images (Library of Congress, 2010). The later dimension corresponds to the so-called "subject indexing", which involves the description of the subject matter of the content, based on "representations" of its topicality. These semantic levels are also referred as to "content-based" and "concept-based" (Matusiak, 2006). These terms are discussed in Section 2.4.

2.2.3. Problems of moving image annotation

The problems associated with indexing moving images are more severe than for textual materials or even than for fixed images[20] because the pointers or locators do not correspond

[20] "The intellectual and practical challenges posed by the semantic indexing of still image material have been widely

to individual signs within the documents. The main problematic issues inherent in moving image indexing and access can be summarized in these three aspects:

(1) The different types of codes (non-linguistic) of which the audiovisual message is made, call for different mechanisms than those used in full-text retrieval in order to facilitate location of specific sequences or images. This problem is referred to by Sandom and Enser (2001), who call film "a blind medium," since "it must be viewed sequentially using specialized equipment before its content can be known. Unlike a book, it contains no integral indexes or content lists, and it cannot be accessed randomly. However, unless a film's content is known, it's commercial, and research potential cannot be realized" (p.142).

(2) The "cognitive transfer problem" (Turner, 2009), consisting of the issues that arise during the conceptual analysis phase of the indexing process, i.e., during the description or representation of the moving image content into textual codes (Hidderley & Rafferty, 1997; Winget, 2009, p. 962). This happens for instance in the traditional keyword-based approach (Hollink, 2006, p. 9) or during the subject description. This is because images have richer semantic dimensions than their textual counterparts due to their multidimensional composition (images, sound, scripts or dialogs), and exhibition settings or external performance factors. In this sense, "images convey different messages to different people, and it is not easy to pre-judge what aspects of an image or film footage will be useful in the future" (Hollink, 2006; Sandom & Enser, 2001, p. 142).

(3) The differences between "content-based" and "concept-based" techniques (see §2.4), which causes a semantic gap in the metadata obtained through each approach. This adds to the already existing disparity between user language and controlled vocabularies in concept-based annotations, which has been identified as a major problem in providing intellectual access to images (Matusiak, 2006, p. 195).

2.2.4. Perspectives in moving image annotation

There are different ways of creating annotations (as defined in §2.2.1). The simplest distinction is between manually and automatically created metadata. However, there are several additional factors to be considered besides the use of automatic algorithms. For instance, Furner (2009) identified eleven dimensions that have been historically relevant to represent the different characteristics of indexing. These dimensions are summarized in

Table 2.1, and are used for the definition of each different perspective of moving image indexing that is introduced in this chapter.

Next, the different perspectives on moving image annotation are described, using Furner's dimensions (as named in column 1 of

reported (e.g., by Armitage & Enser, 1997; Enser, 2008a; Fidel, 1997; Hollink, 2006; X. Huang, Soergel, & Klavans, 2015; Jespersen & Jespersen, 2004; Jörgensen, 2003, 2009; Layne, 1986; Rasmussen, 1997). In the case of moving image material, "the challenges are accentuated, but less often encountered in the literature" (Enser & Sandom, 2002).

Table 2.1) to define each perspective.

Table 2.1. Dimensions for the study of different perspectives on moving image annotation *(adapted from Furner, 2009)*[21].

Annotation dimension[22]	Adapted Furner's (2009) definition
1. Level of automation	The extent to which automated techniques (algorithms) for the assignment of index terms to resources are applied (automatic vs. manual indexing)
2. Level of representation	The extent to which assignment is made of index terms that occur in any texts contained in or associated with the resources (derivative vs. ascriptive indexing).
3. Level of terms control	The extent to which assignment is made of index terms that occur in any predefined lists of allowable terms, rather than terms that do not (controlled vocabulary vs. natural language indexing).
4. Level of participation	The extent to which multiple annotators' choices or "votes" are aggregated in generating the set of terms for a single document (democratic vs. autocratic annotation).
5. Level of source authorship	The degree to which the annotator has responsibility for the creation and/or dissemination of the resources being annotated.
6. Level of interest in the source	The degree to which the annotator has an interest in reading, viewing, or otherwise using the resources being annotated.
7. Level of indexing expertise	The level at which the annotator has expertise in the practice of indexing (or annotating).
8. Level of familiarity with content	The level at which the annotator has knowledge of the content* and contexts of the resources being annotated.
9. Level of IR stewardship	The degree to which the annotator is motivated by a wish to improve the effectiveness of future searches carried out 1) by others; and/or, 2) by her/himself.
10. Semantic level	The extent to which properties other than the "aboutness" of resources are represented by index terms.
11. Types of signs	The extent to which the resources being indexed contain (or are associated with) directly analyzable or interpretable verbal text.

Although most perspectives apply to documents of different kinds, i.e., not only to moving images, in the remainder of this chapter, solely initiatives referring to still or moving images, as defined above (§2.2.1), are described. These perspectives emerged from a literature

[21] The second column includes definitions as found in Furner's (2009), adapted in some cases by changing the term "indexing" for "annotating", according to the definition presented in this thesis (§3.4.5). The first and third columns indicate the terms that will be used along this thesis; they are not used by Furner as such.
[22] This label is provided by this thesis' author, not by Furner (2009).

review on this subject.[23]

2.3. Information professionals' annotations

According to the categories presented in

Table 2.1, this perspective includes annotations (and standards) created by information professionals with a high level of indexing expertise and stewardship, which means interest in applying the methods established to increase the quality of the annotations. These annotations are usually generated manually, or semi-automatically, with a very low level of participation (autocratic indexing), and with a high level of control in the terms used to index the documents.

This perspective is associated with traditional concept-based indexing techniques, as done by human indexers through the use of cataloging, archival or metadata standards that are shared by broader communities (e.g., librarians, archivists and broadcasters). Usually, this approach is characterized by being tied to a given memory institution (e.g., an archive, a museum, or a library), where information professionals perform the intellectual work of cataloging or indexing the items in a collection. Also, it relates to the work of communities of information professionals who design the standards (e.g., the FIAF or the FIAT/IFTA associations, or the W3C consortium).

2.3.1. Cataloging and indexing from an information professionals' perspective

Providing content descriptions or creating content representations that facilitate further retrieval have been normally the most common "annotating"-related tasks, performed in the realm of bibliographic control.

The entire process of cataloging, as performed by information professionals, is traditionally divided into (1) descriptive cataloging, (2) subject analysis, and (3) authority control. **Descriptive cataloging** accounts for the properties of the works and their carriers (through identification of authors, titles, sources, and other bibliographic elements). Descriptive cataloging does not outline the topical content* of the resource, which is the concern of subject cataloging (A. G. Taylor & Joudrey, 2009). **Subject cataloging** is usually known as

[23] The literature review in this section was done through bibliographic searches in the "Scopus" database, and at information sciences specialized databases (LISA and LISTA), as well as in domain oriented databases (i.e., the "FIAF database"). This was complemented with on-site consultation to two film archive libraries: Filmoteca de Catalunya (Spain), and the Eye Film Museum in the Netherlands. Keywords used in database searches included: (audiovisual, film, moving image) AND (metadata, cataloging, cataloging). Additional keywords, depending on the database, included: cataloging of filmstrips; cataloging of motion pictures; cataloging of video recordings; filmstrips; motion pictures; footage; audiovisual; multimedia*; indexing and retrieval of non-text information; content-based retrieval; multimedia retrieval; *crowdsoucing*; social tagging. There was no time scope set during the search. Source selection based on currency depended on the sub-section (e.g., for the section on cataloging standards, no currency criteria were followed, but for the section on metadata standards, more current sources were preferred). Additionally, examples that are used to illustrate the concepts come generally from initiatives at the European or international level about digitization and online access to cultural heritage. These are usually disseminated through project reports, not necessarily to research papers.

"subject indexing", or simply as "indexing".

In a traditional cataloging perspective, subject indexing is a process that includes both identification of the subject matter that a document deals with, and abstracting, which is used to summarize the content* of the item (Lancaster, 2003, p. 1). The subject indexing process consists of two steps, as explained by Lancaster (2003, p.200): (1) conceptual analysis, in which the aboutness of the document is determined, and (2) translation, which in the LIS domain refers to the selection of the terms that will represent the concepts selected in the first step.

The next subsections review the literature on existing standards that guide the work of the cataloguer or information professional performing the aforementioned processes applied to moving images, generally at a film, television or media archive.

2.3.2. Cataloging and metadata standards

Cataloging standards have a long history that goes along the efforts to provide access to document collections and information. The first cataloging standard reported in historical compendia is a French manual, issued by the official printing office in Paris in 1791 (Daily & Hanson, 2009). As these authors explain, subsequent cataloging rules have given preference to the "monograph" over other publication forms, staying behind the growing number of publication types outside of this realm.

The history of **moving image cataloging** starts later than the production of moving images themselves. Indeed, as Hernández (2011) describes, when film was being created (at the end of the nineteen century), Paul Otlet and Henry La Fontaine were occupied in creating the universal bibliographic repertoire, in which only knowledge disseminated through books and journals was taken into account.

The first international standard for cataloging moving images comes from the film domain: the "Rules for Use in the Cataloging Department of the National Film Library", by the British Film Institute, issued in 1951. This is the first cataloging code for films reported in the literature, followed by the "Rules for Descriptive Cataloging in the Library of Congress; Motion Pictures and Filmstrips", issued in 1952 (Yee, 2007).

2.3.2.1.Cataloging standards

At the present time (2015), there are two international standards for cataloging moving images, one originating from the moving image archival community, and one from the library sector: the "FIAF cataloging rules for film archives", and the "Archival Moving Image Materials: A Cataloging Manual" (known as AMIM, or currently as AMIM2), authored by a committee of the Library of Congress in the United States. Together with these current cataloging standards, there are several metadata standards, which will be reviewed in the next section (§2.3.2.2).

The FIAF cataloging rules were first issued in 1979 as a manual (entitled "Film cataloging"). The first edition of the rules was published in 1991, adopting the library specifications "International Standard Bibliographic Description" (ISBD) for Non-Book Materials[24], and information technologies available at the time. This edition is still applied today, although it is under revision. The date of the forthcoming edition is not released yet, but there is a publicly available draft version updated in November 2014 (International Federation of Film Archives, 2014). This new version is inspired by the Functional Requirements for Bibliographic Records (FRBR) model[25], which conceptualized the distinction between a "work"* and its corresponding expressions, manifestations and items. This initiative comes from the Federation of Library Associations and Institutions (IFLA), who in 1998 proposed those levels in an effort to improve catalog databases. The concept of "work" is the most abstract level of description, since it corresponds to the artistic content rather than to its embodiments in specific media or formats. The forthcoming version of the FIAF cataloging rules is greatly based on the textbook written by Yee (2007), who has provided significant contributions to the adaptation of existing cataloging standards to the characteristics of moving image works. According to the current FIAF specifications, a moving image work is described by using the following areas: Titles; Dates (copyright / production); Categories (fiction / non-fiction); Part - Whole conditions (serial / standalone / component part); Content: Synopsis, Genre, Subject; Agents: Cast, Credits, Rights holders[26].

The first edition of the AMIM manual was published in 1984, and there is a second edition issued in 2000, still applied to date (Library of Congress AMIM Revision Committee, 2000). These rules are made in order to provide guidance on how to catalog moving image materials that are part of broader archival collections, that is, which include a bigger variety of sources. The manual itself indicates this: "archives holding moving image material that is exclusively of a single format or type, e.g., commercials, oral histories, stock shots, or video art, will find

[24] Libraries often group film and other audiovisual documents into the so called "non-book materials" or "special collections." Already in 1967, an article in an important library journal was describing the problem of how to proceed with "special collections" of films, phonographs, or pictures, and the limitations of the prevailing cataloging rules of the time in prescribing how to deal with those collections (Daily, 1967). This situation does not seem to have changed significantly; for instance Alonso-Lifant and Chaín-Navarro (2013) found a lack of detail for valuable information in standards for cartographic materials, as compared to information that is offered by web services such as Google sky. De Keyser (2012) gives a cutting remark when he says: "librarians have experience with indexing films, videos and DVDs: they simply use the same methods they have for indexing books" (p.101).

[25] The FRBR model is actually a comprehensive "family of conceptual models" (Smiraglia, Riva, & Žumer, 2014) that has a broader application scope. It includes three groups with their respective entities: Group 1, related to the works* and their entities (i.e., "work", "expression", "manifestation" and "item"); Group 2, related to the agents (i.e., "person", "corporate body"); and, Group 3, related to the subjects and the entities (i.e., "concept", "object", "place" and "event"; and more recently "thema" and "nomen"). There are different working and research groups developing each of these conceptual framewors and issuing the respective guidelines. For instance, for Group 1, the "functional requirements for bibliographic records" (FRBR), for group 2, the "functional requirements for authority data" (FRAD), and for group 3, the functional requirements for subject authority data (FRSAD). A brief discussion about these models is presented at the end of this chapter (§2.9)

[26] Rules for cataloging audiovisual works are also included in the current version of the library cataloging rules, the "Resource Description and Access (RDA)" standard, issued in 2010, which updated the AACR2. These rules are applied by libraries worldwide, which may also collect moving images. The RDA cataloging rules also follow the functional requirements of the FRBR model. In the library sector, the most current effort to adapt these standards to the context of the Semantic Web is the initiative called "BIBFRAME"[(rw)], by the Library of Congress, which will constitute a replacement for the MARC format, in use for several decades.

only general guidelines for describing collections of this nature. Those archives will probably need to develop more detailed policies and rules for their specific collections." The AMIM rules are also inspired by the aforementioned concept of "work". Also, they adapt the "Machine Readable Cataloging" (MARC) format and ISBD rules. According to the AMIM2 specifications, a moving image work is described by using the following areas: title and statement of responsibility; version, edition; country of production; distribution, release, broadcast; physical description; series; note.

Comparatively, standardization bodies, such as the European Committee for Standardization (CEN) issued the EN 15907 standard for film identification, which prescribes a set of elements for the description of cinematographic works. This standard is being adopted in the new forthcoming edition of the FIAF cataloging rules.

Also, these rules are also adapted and/or translated by archivists associations in different countries: for example, the Canadian Rules for Archival Description are used for cataloging moving images in that country; or the UNE-EN 15907:2011 adapts the EN 15907 standard to Spain (Brandón Antelo, 2012). Moreover, in the context of current international projects which aggregate records from different archives, there are emerging metadata frameworks, which have evolved from these cataloging standards. They will be reviewed later in this section.

2.3.2.2.Metadata standards

Similarly to the cataloging rules described above, metadata* standards attempt to normalize the description of documents in order to make them exchangeable. The term "metadata" (as discussed before in §2.2.1) is relatively new in the terminology used by the LIS community, and came to replace terms such as 'bibliographic description' or 'indexing' (Lancaster, 2003, p.xi). Currently, the term metadata is being used by different communities to refer to different types of descriptions created with the purpose of describing information resources, online or offline, and regardless of their potential to be processed automatically or not (Greenberg, 2009; NISO Press, 2004).

However, there are differences between cataloging (as described in §2.3.2.1) and metadata. Loewy (2009) describes these differences in four key points, which could be summarized in that cataloging rules define a methodology, by offering conventions for uniformity and consistency, while metadata sets define pieces or elements of information and their relationships by making them processable by machines. Likewise, the W3C defines metadata as "machine understandable information for the web" (W3C, 2001).

Thus, as suggested before (§2.2.1), in this section the term is used in a narrow sense, indicating the fact that in the realm of digitally generated documents, digital devices often provide automatically generated metadata for media works that are digitally born or made digital through digitization, which is somehow a different perspective than the previous one, in which annotations were predominantly created manually.

Metadata standards in the audiovisual and media domain are numerous. Some authors present an overview (Bauer, Boch, Poncin, & Herben-Leffring, 2005; Filmstandards.org, 2011b; Jong, 2003; Rodríguez & Pérez, 2011; Stanchev, 2011), classifying existing standards using different categories. For instance, Filmstandards.org (2011b) categorizes them by provenance and professional communities who use the standards. Not all of them are specifically applicable to media works, but they are related somehow to moving images as documents. The main categories presented by Filmstandards.org are:

- Standards for TV archives: with a focus on digital production and distribution chain, which include: (a) Committee standards (i.e., SMPTE 335M Metadata Dictionary, MPEG-7 Metadata Schema, EBU P/META Schemas), and (b) Specifications from individual broadcasters (e.g, BBC's SMEF, Danmarks Radio, and many others).
- Standards for media distributors: ISAN (International Standard Audiovisual Number, ISO 15706); TV Anytime Forum Standards, ONIX Standards from EDItEUR, and various rights and content protection standards (numerous specifications exist for expressing rights and restrictions as metadata, usually for embedding in digital media objects).
- Core (minimalist) metadata standards: Dublin Core Element Set, PBCore, EBUCore, FIAT/IFTA minimal data list.
- Standards for embedded metadata: ID2/ID3, EXIF, SMPTE DMS-1, MPEG-21, XMP, W3C Ontology for media resources.
- General library metadata-related standards: AACR, ISBD, RDA, MARC, DC, etc.
- General archival metadata standards: ISAD(G), EAD.
- Museum metadata standards: CCO, VRA, CDWA, LIDO, plus several national standards such as SPECTRUM (UK).

In turn, Rodríguez and Pérez (2011) propose a different classification of audiovisual metadata, observing their function in the media production workflow. The main categories are shown in Figure 2.2, where the first level (generic schemes*) corresponds to the simpler standards, meant to be common to all the others. The second level (global schemes), comprises standards that are meant to be used in the audiovisual creation, production and distribution workflow. The third level (exchange) is composed of standards that are intended to facilitate metadata exchange between producers and distributors. The following level (spectators) corresponds to schemes that are designed to standardize the metadata required during interactive display to the final user. The final level (archival) corresponds to library and film archival standards.

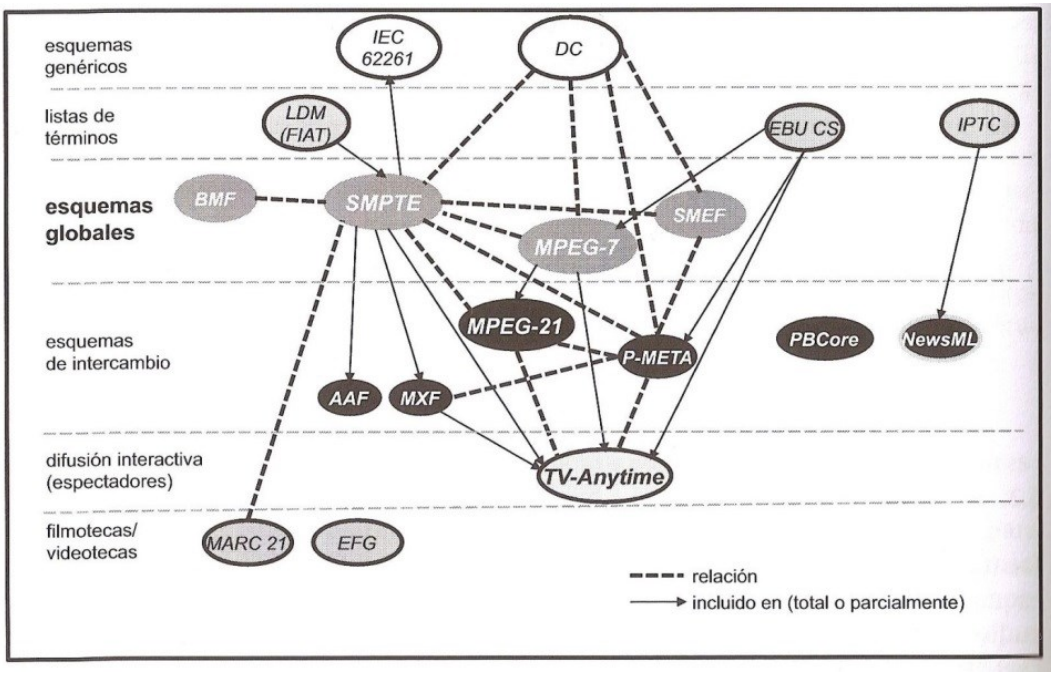

Figure 2.2. Relationships between a set of audiovisual metadata standards (Rodríguez & Pérez, 2011).

A large number of metadata standards and properties are used by different institutions, and throughout the audiovisual media production process. Höfferning and Bailer (2009) investigated solutions to solve the metadata interoperability issues at this workflow level by proposing an encompassing semantic ontology. The authors apply this work to subsequent research about the metadata interoperability between different audiovisual archives (Höffernig, Bailer, Nagler, & Mülner, 2011).

Attempts to provide **broader (minimalists) standards** that allow the mapping between the different standards used by the individual archives with the aim of facilitating interoperability and aggregation have been undertaken in the last decade, mostly in the framework of international or pan-European projects that facilitate interoperability and semi-automatic data aggregation. Earlier initiatives to create union catalogs in the film domain go back to 1984 with the "National Moving Image Database" (NAMID), and the "Moving Image Cataloging" (MIC) projects. Andreano (2008) comments on the disappearance of the first one, and there is no evidence of the survival of the second initiative, which is offline to date (2015).

Bauer et al. (2005) conducted one of the early studies about the use of different standards by audiovisual archives in the framework of the Presto Space Project (that ran between 2004 and 2006). The most representative examples of current projects in the audiovisual domain are **EFG** (The European Film Gateway), that is an initiative promoted by several European film archives; and **EUScreen**, an initiative coming from the television archives sector. Both projects have developed metadata schemes that allow for the interoperability between the different participating archives, and thus, made automatic aggregation possible. The first is the EFG interoperability schema (The European Film Gateway, 2009), and the latter is EBUCore. These

standards do not provide rules for creation of the annotations (metadata). Instead, their aim is to provide top-level ontologies that reuse or map already existing standards (Hennicke, Olensky, de Boer, Isaac, & Wielemaker, 2011). These high-level models are, therefore, used at a subsequent stage, when the media works have been already annotated or catalogued.

Finally, the tendency of these wide scope standards is to adapt to current efforts for sharing information on the web, and mostly, to make data machine-readable through the use of Semantic Web and Linked Data standards. This topic will be discussed next.

2.3.2.3.Controlled vocabularies

Controlled vocabularies, also called "indexing languages", or "Knowledge Organization Systems" (KOSs)* consist of normalized arrangements of terms that are used during content description in order to keep consistency and provide the underlying structures for organizing information. The range of complexity varies from simple lists of terms (e.g., authority files) to term-based ontologies and semantic networks, including classification schemes and thesauri (see Zeng, 2008 for a proposed taxonomy of "Knowledge Organization Systems" KOSs).

Even though controlled vocabularies are often used at an individual or corporate level, there are several initiatives to promote their standardization and use at an international level. Some of the most widely promoted initiatives in the realm of visual information (as listed in Baca, 2009) are:

- "Art & Architecture Thesaurus" (AAT): created by the Getty Research Institute in 1970.
- ICONCLASS: a classification system for iconographic research and documentation* of images
- The Thesaurus for Graphic Materials: created by The Library of Congress. Contains terms to describe both the subjects and the object/work types of graphic materials*.

In the moving images domain, the following are among the most important controlled vocabularies:

- The "Library of Congress Subject Headings" (LCSH) for film and video (Intner, Swanson, & Intner, 2011)[27];
- The International Federation of Film Archives (FIAF) thesaurus(rw);
- A Glossary of Filmographic Terms (by FIAF);
- The "Common Thesaurus Audiovisual Archives" (GTAA)(rw): used by audiovisual archives in The Netherlands;
- The "National Film Board's thesaurus": used by the Canadian archives (Turner et al., 2002);

[27] This book, known as the "Subject Access to Films and Videos" (SAFV1) appeared for the first time at the end of the 1980's, the second edition (SAFV2) is an updated compilation made by Bobby Ferguson of the LCSH subject descriptors and genre term headings that pertain to the realm of moving image cataloging.

- The Moving Image Genre-Form Guide (MIG-FG): by The Library of Congress. No longer updated.
- LSCOM$^{(rw)}$: The Large-Scale Concept Ontology for Multimedia, it was a project that took place between 2004 and 2006, which intended to create a taxonomy of 1,000 concepts for describing broadcast news video, including events, objects, locations, people, and programs. To date, the ontology is available but not further developed.

There is evidence that these vocabularies (or others of a broader spectrum) are used in practice in film and media archives. For instance, the survey reported in the Compendium of Moving Image Cataloging Practice (Martin, 2001) found that from the 27 survey respondents: 21 used some sort of standardized list (e.g., for subjects, genres or names); 12 used the LCSH; 6 used the "Moving Image Materials: Genre Terms"; 9 used and in-house subject or genre list; 3 used the AAT, 2 used the "Thesaurus for Graphic Materials", and 1 used the "Hebrew Subject Headings".

The "Visual Information Retrieval for Archival Moving Imagery" (VIRAMI) project (Sandom & Enser, 2001, 2002) found that content access was provided at some of their investigated archives via subject descriptions in the form of classification systems (e.g., the "National Film and Television Archive" (NFTVA) of the British Film Institute, BBC Library and Archive, and the Natural History Unit Library, which used systems based on Universal Decimal Classification). Other archives used keyword access, by using controlled vocabularies or not (Sandom & Enser, 2001).

Turner et al., (2002) found that seven of the fourteen collections investigated from eleven North American moving image archives used natural language keywords during the indexing process, without any form of control. Six collections used subject headings, and three a classification scheme developed in-house. Rarely, a list of technical terms specific to the area of film, or a list of geographic descriptors was also used. From the institutions using controlled vocabularies, two used a commercial thesaurus and five an in-house developed thesaurus. The authors confirm, also at this level, their other findings of the disparity of methods used among the investigated moving images archives. Still, the authors advocate for the need to have a common thesaurus for shot-level indexing.

An important semantic level that is usually controlled in audiovisual archives is genre, and film feature classification. Between 2010 and 2011, the British Film Institute (BFI) conducted a revision of all the terms used for genres to promote consistency and the 'literary warrant' principle (i.e., assuring that those terms correspond to the domain terminology). Esteban (2012) describes the project in detail, presenting evidence for the need of these taxonomies for collection access. She also describes the issues related to the description of non-fiction collections. Indeed, there seems to be a mismatch between the terms needed in television (non-fiction) oriented archives, and film archives. Discussions about the need for using different categories in these two areas take place in the area of **fiction indexing** (Lilja, 2008).

Current developments in the area of controlled vocabularies in the audiovisual domain are

aligned with efforts from the Semantic Web community, more specifically in the domain of "**Linked Data."** This initiative consists in allowing transparent and machine-readable publication and reuse of the vocabularies, and also of the items' metadata, by means of using web standards based on the "Resource Description Framework" (RDF) specification and "Simple Knowledge Organization System" (SKOS) standard representations.

In the cultural heritage sector, this initiative is gaining adepts, and many of the metadata standards and ontologies that were developed for local use are now published in this way, with concepts uniquely identified and explained. In this sector, the Amsterdam Museum became "the first 'small' cultural heritage institution with a node in the Linked Data cloud" (De Boer, Wielemaker, et al., 2012).

In relation to moving images, examples of these projects are the "BBC ontologies" [(rw)], and "Open Cultuur Data" [(rw)], which makes the "Common Thesaurus Audiovisual Archives" (GTAA) available as "linked open data" (LOD).

2.3.2.4.Professional cataloging and metadata standards in practice

A few works that survey how cataloging moving images is done **in practice** by different worldwide moving image archives have shown that these international standards are mostly used in combination with other standards, or replaced by in-house developed rules. Next, the main conclusions from the most renowned surveys are described:

(1) "The Compendium of Moving Image Cataloging Practice" (Martin, 2001), which in 2014 was in the process of being updated, presents the result of a survey of 27 moving image archives, mostly based in the US, through a 78-question survey which covers all aspects related to cataloging and indexing. The findings show that "no set of rules was used alone, with the exception of local in-house rules". These locally developed rules are used by six institutions, which rely solely on them. Eighteen institutions use the AACR2 in combination with other rules. Nine use AMIM, also combined with other standards, and six use the Archives, Personal Papers, and Manuscripts (APPM), a standard for developing a catalog of archival materials. The FIAF cataloging rules were used by three institutions.

(2) The VIRAMI project (Enser and Sandom, 2002), carried out for two years (2000-2002), was a research project in the UK, undertaken by the University of Brighton and funded by *re:source*, the Council for Museums, Archives and Libraries. It is one of the most detailed studies about the use of cataloging standards and user requests at film archives. The project aimed to investigate the then current practices in moving image retrieval, both from the perspective of the information providers (the archives) and from the information seeker's perspective (Sandom and Enser, 2001). The first part of the study consisted of eleven case studies, each one constituted by a specific film archive, which was surveyed for examples of requests, visits to the archive, and semi-structured interviews with the employees. In relation to the use of cataloging standards, the authors found that of the eleven case study collections, three - the Imperial War Museum, the National Film and Television Archive and

the North West Film Archive - based their cataloging on FIAF standards; none of the other archives catalogued according to any of the published standards; instead, internally created rules and procedures were used (Sandom and Enser, 2002).

(3) The Survey of Cataloging Practice 2005-2006 carried out by the FIAF. This survey was sent to all associated archives[28] (more than 124), from which 20% responded. Two-thirds of these respondents are European archives. The findings confirm the previous studies in that the FIAF Rules, when used, are combined with other standard rules (such as ISBD, AACR2, FRBR, ISAD or national standards). The main finding is that the FIAF rules are no longer used strictly by film archives, but used as a framework for adapted cataloging rules ("The FIAF RULES revision project: the state of the art," 2008).

Although the main expectation of **metadata standards** is to be widely used, this does not seem to be the case in practice. According to the "EBU Archives Report" (EBU Technical, 2010), "in-house developed (proprietary) and Dublin Core based formats are the two most common Broadcasters' choices in the archive environment [and] in-house formats are more frequently specified for internal archive usage, whereas Dublin Core based formats serve mainly for Metadata exchange between archive and production (maybe a variety of different systems)." Likewise, surveys in specific countries or regions about the use of international metadata standards in practice confirm these findings; e.g., Ruhl (2012) found that 79.30% (180 of a total of 388 participants from German archives of all types) did not use standards for the annotation of audiovisual media like pictures, audio and video files (analog and digital). Also, Hauttekeete et al., (2011) identified in a study with 45 representatives from different Flemish archives, that only four organizations used an international metadata standard; in this case Dublin Core or EBU/P-Meta. Similarly, twenty of the participating leading archives in the "EUScreenXL" project also report to be using in-house developed metadata specifications alone, or in combination with other standards (e.g., Dublin Core, EAD, and CEN standards) (EUscreenXL, 2013).

At a practical level, that is, in the daily work of a moving image archive, annotations are gathered through the use of information processing systems, such as databases, "Online Public Access Catalogs" (OPACs), or "Media Assets Management Systems" (MAM), which in certain cases provide access to moving image content via a combination of manual professional cataloging, as it was described here, and automatic retrieval mechanisms.

Finally, few papers in the research literature suggest that the task of indexing, often performed by professional indexers individually, could be developed in a collaborative way. These studies fall into the realm of what is understood in this thesis as "indexing behavior" (see §3.4.1).

[28] It was not possible to find a report about this survey. The only information available comes from the presentation cited above. The number of affiliates in 2005 is a number between 124 (the affiliates in 1999, as reported in the FIAF website, and 152, from the last version of the affiliates list in 2015).

2.3.3. Content annotation levels from an information professionals' perspective

There are several strategies to produce annotations at the content level (from the item level onwards in Figure 2.1) in the information professionals' annotating perspective. According to Sandom & Enser (Sandom & Enser, 2001, p. 142) content annotation can be done in at least two different ways: (1) through a comprehensive synopsis, usually applied to the entire media work, or (2) through a detailed list of shots, what is called "shot listing". To illustrate the annotations at different content levels produced from an information professionals' perspective, a few examples found in the literature are included next:

Example 1. Controlled subject description at the item level.

Subject headings for topics and genre for the movie "Metropolis" (annotation at the item level, according to Figure 1) provided at the UCLA film and television archive:

> *Classism –Drama; Working class –Drama; Rich people –Drama; German films; Silent films; Science fiction; Features.*

Example 2. Textual plot description at the item level.

Synopsis for an 80-minute feature film made in 1996, from the archive of Irish Film at the Irish Film and Television Net website (Sandom & Enser, 2001, p. 150):

> *"This film is a tragicomic story of deceit, lust and incest between two middle-class couples over a weekend in Dublin."*

These short synopses "rather than serious subject description, […] are more for Internet browsers rather than footage research" (Sandom & Enser, 2001).

Example 3. Full content description at the shot level.

A typical shot listing provides a detailed and often time-coded representation of the content of each shot (Enser & Sandom, 2002). It looks like in the example provided by these authors (Figure 2.3).

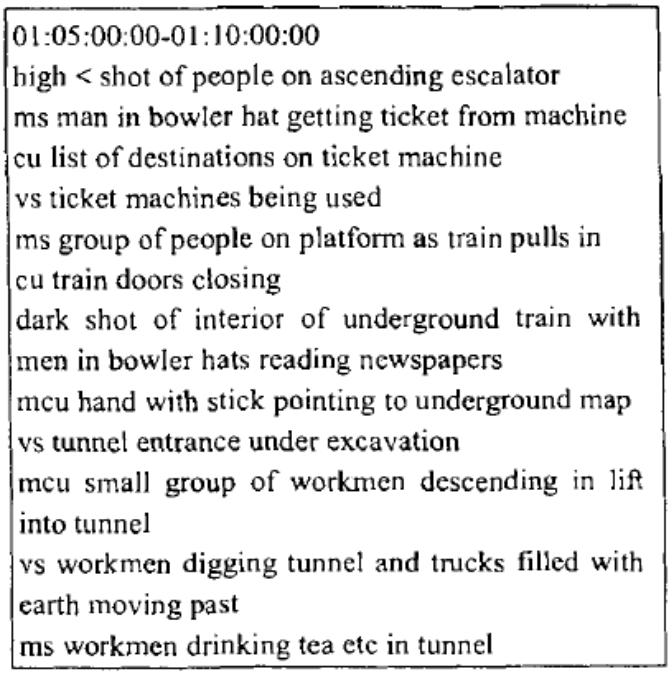
01:05:00:00-01:10:00:00
high < shot of people on ascending escalator
ms man in bowler hat getting ticket from machine
cu list of destinations on ticket machine
vs ticket machines being used
ms group of people on platform as train pulls in
cu train doors closing
dark shot of interior of underground train with men in bowler hats reading newspapers
mcu hand with stick pointing to underground map
vs tunnel entrance under excavation
mcu small group of workmen descending in lift into tunnel
vs workmen digging tunnel and trucks filled with earth moving past
ms workmen drinking tea etc in tunnel

Figure 2.3. Excerpt of a full shot list for a London transport film (Sandom and Enser, 2001, from the Images (London) Ltd's database).[29]

There is evidence that these shot lists and screening notes are elaborated and kept by professional "film researchers", who search for moving images (or footage) during film or television production. These professionals need to maintain these lists with timecodes and detailed descriptions for each individual project they work on. The descriptions of the footage for this purpose also includes names of people featured and locations (Simpson-Young & Yap, 1995).

In any case, creating content descriptions manually during the process of cataloging is a time-consuming task. Sandom & Enser (2002) estimate that creating shot lists for a one hour of transmission (in this case for a television broadcast) may take between 16 and 30 hours. These lists can have several lines (more than thirty for a five-minute clip, according to Sandom & Enser, 2001). Film archives which used to practice this type of description in the past may have had to stop due to time or budget constraints. This is the case of the BFI, according a curator interviewed during an FIAF conference) (B. Dixon, personal communication, April 23, 2013). However, as explained by an information specialist from the Information Department at this institution, time-based descriptions are still done at the BFI in a few selected cases, at one department called "Footage sales." But this is not the common practice. The most frequent procedure consists of using the subject and synopsis fields of the cataloging standards (Esteban, personal communication, April 3, 2014). One example of a television archive that provides fine-grained access to researchers is the Boston's PBS station, WGBH, which indexes resources at the "sub-item or shot-log level" (Michael, Todorovic, & Beer, 2009, as cited in Geisler, Willard, & Whitworth, 2010).

[29] Abbreviations in Figure 2.3 mean: "High <": high angle; "ms": medium shot; "cu": close-up shot ; "vs": various shots.

Those annotations are done by specific archives, which develop in-house rules and/or use manual annotations in combination with automatic techniques, or those techniques alone (see §2.3.2.3), but, as commented before, there is little or no guidance on how to elaborate shot lists or sequence descriptions for indexing purposes.

However, since these detailed analyses are often performed by domain specialists, literature in that area could be a source for these guidelines. This was the purpose of a master thesis in the Information Sciences by López Hernández (2003), who proposed a template for sequence annotations to be used by information professionals, based on existing film theory. In her example to support the proposal, the Spanish movie "Solas" directed by Benito Zambrano, was divided into 35 sequences, each one described by different dimensions: types of shots, time, space, light, characters, actions, dialogs, and music/sound. These and similar models are described later (§2.8).

The value of fine-grained annotations, as in Example 3, is mostly seen by commercially-oriented archives: "commercial firms which sell film clips index them by adding a lot of keywords, in order to let the customer find what he needs in as many ways as possible" (De Keyser, 2012). A recent initiative, which shows the enormous potential of this type of annotations is described by (Madrigal, 2014) who explains how "Netflix", one of the most popular on-demand Internet streaming media services, uses **microgenre** tags created by people hired by this company. This initiative combines human work with automatic algorithms (see §2.6 for more details).

Example 4. Selective content description at the shot level.

Wilkie (1999) presents an example of the main data elements required for cataloging a typical film or video. From his example, it can be observed that content description should be composed of four levels: a summary, selected shots (actuality), content listing, subject terms, and genre.

- Annotation: Documentary film, presented by Edward Smith, about the career of David Johnson, from beginning work in the post room at Sunshine Enterprises to becoming chairman of the company. Includes interviews with Johnson and colleagues.
- Actuality:
    - various shots London skyline, including St Paul's Cathedral (5.12-5.45)
    - Low angle shot Fleet St., bus approaches camera (00.10-00.30)
    - Commuters out of Embankment Underground Station (07.20-07.55) David Johnson out of station, towards camera, hails taxi (07.55-08.10)
- Interviews: David Johnson childhood in London's East End, including World War II (01.15-01.45) ambition to be a jazz trumpeter (06.25-06.35) [continues description of selected interview fragments]
- Subject terms:
    - Sunshine Enterprises/Chairmen
    - London/Blitz (World War II)
- Genres: Documentaries; Profiles

Figure 2.4. Example of a selective content description at the shot level (Wilkie, 1999).

The element called "Actuality" in Wilkie's (1999) example actually reflects a tendency in the indexing of fiction works. Lancaster (2003) reviews the work done in the context of the "Book House" project in Denmark, where elements such as cognition or emotional information (e.g., "criticism of man's pollution of the seas…", or "exciting, "sad") are added to each book's content description.

Example 5. Keyword ofness description at the fragment level.

De Keyser (2012) presents an example of the manual indexing done at Getty Images for a 25-second clip about a sale of pigs in a Bavarian Alpine field gets the following keywords:

> *'Tranquil Scene', 'Nature', 'Outdoors', 'Rural Scene', 'Grazing', 'Bavaria', 'Cloud', 'Evergreen Tree', 'Hill', 'Mountain Peak', 'Day', 'Lake', 'Color Image', 'Domestic pig', 'Grass', 'Bavarian Alps', 'Real-time', 'Cinematography', 'Zoom in', 'Medium group of animals', 'Nobody', 'Livestock', '20 seconds or greater', '2006'.*

Example 6. **Textual content description at the collection level**.

Leigh (2006) presents the following example of a catalog record with content descriptions at this level:

> *Scope and content: Scenes of bull raising, branding, and bullfighting as well as a religious ritual. Consists of approximately 75,145 feet of black-and-white nitrate film rolls in 52 cans, of which 7,000 feet has been preserved on safety positive film.*

Even though from the previous examples the potential value of annotations at the sequence

and shot-level can be deducted, due to the big amount of materials that moving image archives have to deal with, Leigh (2006) questions the predominant model of describing at the item level, presenting a proposal for the descriptions at the **collection level**. According to her, "collection level descriptions serve both to provide superficial overviews for large bodies of otherwise uncatalogued materials, as well as play an important role in reducing the quantity of material returned in an initial search query across multiple services". The content description at the collection level includes listings of individual items, but also indications of important scenes that may be found, for which descriptions at the shot-level would be unnecessary. As Leigh explains:

> "Certain types of materials, such as home movies from an individual, outtakes derived from a major feature film, or a series of commercials are best described at the collection level, as researchers can better study individual items when each is examined as emerging from the larger context of the whole" (Leigh, 2006, p.37).

This archival approach is reflected in the use of the so-called "finding aids," which are used to preserve the hierarchical granularity levels and complex relations between archival materials. Marchionini, Tibbo, et al., (2009) used this approach applied to the creation of multimedia-enhanced finding aids for digital videos, which facilitate maintaining structural contextual information at the different levels. For example, at the top-level, the finding aid provides collective contextual information; at the second level, videos are grouped, for instance, by topic or episode; at the third level, access to the individual videos is provided, by presenting surrogate information that goes also to the frame level (via storyboards, fast-forwards, excerpts, or keyframes). (See also §2.4 for information about the low-level type of annotation).

From the previous examples, the application, at different levels, of the concepts of "ofness" and "aboutness" described before (§2.2.1) can be observed. As Enser and Sandom clearly explain: "The different characteristics of shot lists and synopses reflect the distinction which has been drawn between the "ofness" and "aboutness" of visual image content […]. Shots are 'of' visible entities, whereas synopses tend to summarize what a particular length of footage is about" (Enser & Sandom, 2002). For example, descriptions in Example 3 have a higher level of "ofness" details, than Examples 1 and 2, which are mostly on "aboutness."

As Wilkie (1999) indicates, certain genres may not need to be shot listed, and only require a summary. However, the range of potential uses of moving images, even of feature films is increasingly acknowledged, as Sandor and Enser (2001) suggest: "as a by-product of their main objective, feature films record contemporary culture and society: transport, fashion, domestic life and artefacts, attitudes, beliefs, behavior, and language." Additionally, there is a growing market for video fragments (De Keyser, 2012), which can hardly, or very costly be supported by manual annotations.

However, in practice, added to the potential different ways to provide interpretations in the

annotation process by the human indexer, the standards are very vague in providing guidelines on how to provide fine-grained content descriptions of the moving images (or at other different levels indicated in Figure 2.1). For example, the standard for film identification EN 15907 defines content description redundantly as "a textual description of the contents of the cinematographic work" (Filmstandards.org, 2011a). These gap in the published standards about how to describe the content of moving images at different levels, adds to the lack of publications providing this guidance, as also Sandom & Enser (2001) noticed.

The most important standards for cataloging moving images, namely the AMIM2 manual and the FIAF (International Federation of Film Archives, 2014), indicate that there should be a summary of the content of a work. The current version of the FIAF cataloging rules (Harrison & FIAF Cataloging Commission, 1991), includes two fields reserved for content descriptions, both in the "Notes area": "Contents*", for listing individual parts or segments of a moving image work consisting of several parts, and "Summary", for providing an "objective description of the film's actual content". This edition of the rules provides several suggestions about the way summaries should be written, which is absent in the draft for the forthcoming edition.

The FIAF forthcoming cataloging rules include an element called "content description (e.g., Synopses, shot lists, etc.)", which is part of the moving image "Work/variant description area". This rule, as in the current 1991 edition, indicates that the summary should be taken, when available, from secondary sources giving proper credit. It also suggests that a content description could be in the form of a listing, in the case the work or variant is an aggregate (i.e., when it includes two or more distinct works). This type of content description is also recommended by the AMIM2 rules and by the current valid version of the FIAF cataloging rules (Harrison & FIAF Cataloging Commission, 1991), mainly in the case of "newsreels, newsreel segments, news films, magazine-format programs, unedited footage, compilation works, home movies that consist of separate events, and any other works that consist of several parts" (Library of Congress AMIM Revision Committee, 2000, p. 16). Descriptions at the scene level are recommended in the draft of the forthcoming edition of the FIAF cataloging rules, in the case of unedited works, indicating prominent people or places or other shots of particular interest if that is the case (International Federation of Film Archives, 2014).

Contrarily to their cataloging counterparts, metadata standards are often used during the media work production and distribution chain, starting from the moment when the media is created (Jong, 2003). This ubiquity causes lack of uniformity in the ways content annotations are created (Aguilar-Gutiérrez & López-De-Solís, 2010), including the use of semi-automatic metadata extraction processes. At least in the two most important global schemes (i.e., SMPTE and MPEG-7) it is possible to observe these differences.

For example, in the **SMPTE** metadata elements dictionary, there are different properties to be added at the so-called "Interpretive" level, which includes two content description options: (02) Descriptive (human assigned), and (03) Descriptors (machine/computer assigned).

Human-assigned descriptions include for example textual annotations of the context of the production, while computer-assigned descriptors include automated content classification or derived words or phrases that summarize an aspect of the data sets (SMPTE Registration Authority, LLC, 2012).

In turn, the **MPEG-7** standard is more precisely a data model for content description of the media works and their fragments. It provides a flexible scheme for coding the content descriptions of different materials (e.g., still pictures, graphics, 3D models, audio, speech, video, and any combination of these elements in a multimedia presentation) (Witten, Bainbridge, & Nichols, 2009). This is how the standard is structured to support content description at all different levels (according to Hunter, 2001; Witten et al., 2009): MPEG-7 is based on four components: "Descriptors" (Ds), "Description Schemes" (DSs), "Description Definition Language" (DDL), and "Systems Tools" [30]. The "Descriptors" are the content features; the "Description Schemes" specify the types of "Descriptors" that can be used and the relationships between them or between other "Description Schemes"; The "Description Definition Language" works as an XML schema, providing the syntactic, structural, and value constraints rules to which valid MPEG-7 "Descriptors", "Description schemes", and "Descriptions" must conform.

In MPEG-7, "Descriptors" can vary depending on the type of media. For instance, in the case of multimedia works, features include low-level audiovisual attributes such as color, texture; high-level features of objects, events, and abstract concepts; as well as more technical data about compression. At each level, it is possible to add summaries. This possibility is combined with the facilities to structure descriptions at different levels to enable hierarchical and sequential navigation (for instance to create audiovisual synopsis). The way in which content descriptions are created in the framework of the MPEG-7 standard is, as mentioned above, a combination of manual and automatic annotations: "MPEG-7 descriptions can be entered by hand or extracted automatically from the signal […]. Some features (color, texture) can best be extracted automatically, while others (e.g., 'this scene contains three shoes,' 'that music was recorded in 1995') cannot be extracted automatically" (Witten et al., 2009). Current research about automatic content metadata extraction is active, as will be described in the next section (§2.4).

Similarly to the previous two specifications and as a result of their broader scope, minimalist metadata standards such as EBUCore or the EFG interoperability schema are also broad in indicating how to structure content descriptions. The **EBUCore** includes three related elements in the scheme: (1) "subjectType", which is "the topic covered by the intellectual content of the resource"; (2) "genre"; and (3) "descriptionType". The standard further explains that subjects are typically expressed by keywords, key phrases, and that free text, controlled vocabularies, authorities, or formal classification schemes (codes) may be

[30] "Tool" is the commonly used term to refer to an information processing system. It is used by different communities, e.g., "digital humanities tools", or "multimedia authoring tools". From now on, the term "tool" is avoided in this thesis, instead other terms are preferred (e.g., IR system*), but in some cases its use is unavoidable.

employed when selecting descriptive subject terms. In relation to the element "description type," the standard states:

> "[It] Consists of a free-form text or a narrative to report general notes, abstracts, or summaries about the intellectual content of a resource. The information may be in the form of a paragraph giving an individual program description, anecdotal interpretations, or brief content reviews. The description may also consist of outlines, lists, bullet points, edit decision lists, indexes, or tables of content, a reference to a graphical representation of content or even a pointer (URI, URL) to an external resource. A running order can also be provided as a description" (EBU Technical, 2014).

One interesting aspect in relation to the terminology used by the standard is the use of the term "tag", which is used as a synonym for "subject terms." The standard documentation indicates: "It is now common to 'tag' content. Tags can be issued by professionals like content creators or content providers, or by users" (EBU Technical, 2014, p. 18).

Likewise, the **EFG interoperability schema** (The European Film Gateway, 2009) provides two optional elements for content account: "Keywords" and "Description". Instructions are broad as expected for the schema, and thus, do not provide guidelines for the different levels of content description that the providers should deliver. Even though, it suggests that it is possible to include textual descriptions such as synopses, plot summaries, reviews, transcripts or shot lists.

Surveys on how cataloging and content description is done at different archives confirm that there are diverse mechanisms in place. From the AMIA survey (Martin, 2001) is not possible to know how often synopsis or other forms of content descriptions are used, or whether shot- listings are eventually used by the participating archives. The questions in the survey do allow concluding that most archives in the study use content descriptions at the item level through manually assigned subjects and/or genre keywords. In the aforementioned VIRAMI study, the findings also indicate that all of the case study collections provided content description of some kind: as an abstract, a summary, a synopsis or a shot list. However, the level of detail varied greatly between the different collections, or even within a single collection, from single-line summaries to multiple pages of shot lists (Sandom & Enser, 2001).

Turner et al. (2002), report on a study carried out between 1999 and 2001 about the techniques used in practice at different organizations that perform shot by shot indexing. The study included eleven North American institutions, comprising television networks and movie production studios on both sides of the Canadian-American border, managing fourteen collections of non-art moving images (Hudon, 2004). Their findings show that eleven of the fourteen collections were catalogued and indexed at the item level; five of the fourteen collections were using indexing at the sequence level; and eight at the shot level. It is important to clarify though, that the sample of institutions was arranged based on the criteria that shot-level indexing was used, as the authors explain: "thirty-three organizations were identified as potential participants in our study. Criteria for participation in the study included having a collection of non-art moving images that had been in operation for at least five

years, and that the collection be indexed at the shot level" (Turner et al., 2002). The relatively high number of archives in the initial sample indicates that shot level descriptions are indeed common in certain types of moving image archives, for example, the commercially-oriented. Indeed, commercially-oriented moving image archives, also known as stock footage* libraries, should respond fast to their clients' demands, and consequently must have high-level detail of content annotations (as in Example 3 above). The fact that these types of archives have existed since 1908[31] indicates that indexing moving image content at a great level of detail must have been done manually for years.

2.4. Automatic annotations

According to the categories presented in

Table 2.1, this perspective includes annotations (and algorithms) created by professionals with a high level of indexing (IR) expertise and stewardship for facilitating retrieval for others. These annotations are generated automatically, with a very low level of participation (autocratic indexing), and with a low to medium level of representation (indexing terms are derived rather than ascribed).

2.4.1. Content-based and concept-based automatic video retrieval

Manual annotation is a time-consuming process, almost impossible to perform at high levels of granularity for the current exponentially increasing audiovisual production. In the case of textual sources, automatic indexing has partially or completely substituted the manual indexing process (Anderson & Pérez-Carballo, 2001b), which even achieves subject ("aboutness") representation through keyword extraction[32]. In the case of moving images, there is evidence of a quest for automatic indexing even for analog films[33], but research has significantly increased with digitization facilities. Significant achievements have been reached, even though different challenges impede an equal success as in the case of textual sources.

Automatic indexing of moving images (or audiovisual content) constitutes a research area on its own which emerged in the early nineties of the twentieth century, called "content-based image retrieval" (CBIR), or "content-based video retrieval" (CBVR), "visual information retrieval" (Enser, 2008a), or "multimedia information retrieval" (Rafferty & Hidderley, 2005)[34]. This discipline crosses the borders of several fields of computer science and other disciplines.

[31] "The Film Library, created in 1908 by Adam Stone, is generally considered the first American stock footage agency" (DeCroix, 1997).

[32] Manual annotation is still performed in comercial Company knowledge bases (e.g., pharmaceutical firms), due to the sensitivity and tailoring of indexing according to company objectives (when value-adding is difficult by pure automatic means) (P. Ingwersen, personal communication, February 2015).

[33] Already in the 1960's a method for "indexing strips of film in electro-optical equipment operated with computers" was patented (Fredkin, 1967).

[34] The term CBIR is preferred to CBVR (which seems more relevant to moving images*), since it is also used in visual information* research.

It uses mechanisms from pattern recognition, artificial intelligence, database technology, signal processing and computer vision (van Leuken, 2009). According to characteristics of the audiovisual message, automatic indexing is done through "content-based" and "concept-based" indexing techniques, which are briefly described next:

Content-based retrieval consists of detecting patterns based on the image low-level visual features (e.g., colors or shapes). Content-based descriptions, also called "the low-level approach" (Turner et al., 2002) are hardly obtained through manual mechanisms, for that reason, content-based annotations are usually understood to be automatic. From the perspective of indexing theory (briefly described in §2.3.1), this type of indexing can achieve identification of objects appearing in fixed or moving images (i.e. a boat, a car), i.e., they can help in identifying what the images are "of." This type of semantic retrieval generally requires human processing, in order to associate the image low-level features with high-level concepts.

In turn, **concept-based retrieval**, also called "high-level" approach (Turner et al., 2002) relies upon representational features of the media works (e.g., the genre) through keywords, subject headings, or other forms of textual representations. Even though this approach is associated with indexing performed by humans, based on the interpretation that users or indexers have of the images, concept-based annotations can be also derived automatically (Stock, 2010). Additionally, there is also a semi-automatic approach for the generation of concept-based annotations. It consists of creating shot-level indexing, by means of merging and extraction from textual sources created during the pre-production, production, and post-production stages, such as closed captioning, audio description, and production scripts (Turner et al., 2002).

Even though concept-based indexing has considerably progressed, there is still a so-called "semantic gap" between low-level and high-level annotations. This gap consists of a "discrepancy between the information that can be derived from the low-level image data and the interpretation that users have of an image" (Hollink, 2006, p. 3). Semantic annotations that can bridge this gap have been investigated, among others, by Hollink, Worring, and Schreiber (2005) who proposed an ontology for visual descriptions based on two existing knowledge corpora (WordNet$^{(rw)}$ and MPEG-7) by creating links between visual (low-level features) and general concepts.

The most important techniques in use in automatic indexing of moving images to date can be summarized in:

–**Automatic keyframe extraction and shot boundary detection**. Basic techniques in CBVR include video segmentation, feature extraction, and feature grouping. These techniques, applied to extracting keyframes and detecting shot boundaries constitute most active research in this field (H. H. Kim & Kim, 2010). Automatic keyframe extraction consists of the automatic extraction of the images that are supposed to have high informational value, to

present them together as an overview. In turn, shot boundary detection (SBD) is the technique to isolate the different shots in a video by using transition image features (e.g., cut and dissolve).

–**Indexing based on speech or text recognition**: consists on applying speech recognition software to the audio in order to generate transcriptions. Nowadays, this is done with videotaped interviews, conferences and news fragments (De Keyser, 2012). Once the text is extracted, textual techniques are applied, such as:

- "named entity recognition;
- person entity extraction and coreference resolution (correlates the names of people with their professions or organizations)
- automatic hyperlinking ("links the information that is found in the clip to the content of news articles on the web in order to enrich the information")
- semantic event extraction (tries to find suitable keywords for each event in the news broadcast using statistical methods).
- Capturing and indexing the subtitles with translations." (De Keyser, 2012)

–**Automatic abstracting.** Pioneer work in creating video summaries to facilitate browsing was done in the "Informedia" project (Christel et al, 1999, as cited in Rüger, 2010) and the "Físchlár" project (Smeaton et al., 2004, as cited in Rüger, 2010). Currently, there are several techniques for video summarization, for instance: future based (e.g., motion, color, gesture, speech); event based; shot selection based, among others (Ajmal, Ashraf, Shakir, Abbas, & Shah, 2012).

–**Multimedia mining for concepts**. Active research is done in object detection (feature extraction) in combination with textual metadata for the derivation of concepts and labels. Aradhye, Toderici, and Yagnik (2009) used these techniques for the analysis of audiovisual features in 25 million YouTube.com videos, "nearly 150 years of video data", which was used to create a bottom-up list of terms (e.g., indoor, outdoor, city, landscape).

–**Contextual data extraction**. Marchionini, Shah, Lee, and Capra (2009) insist on the need of contextual information to facilitate users' understanding and interpretations of audiovisual content. They studied automatic techniques for extracting contextual information from YouTube videos, by using data from users' interactions and usage data. The authors also studied how to perform automatic queries ("query-based harvesting") in order to support curators searching for specific topics. This was done through the development of an IR system called "ContextMiner", which allows a person to specify a set of queries and parameters, as well as the websites to harvest and the frequencies of the automatic queries. The results are also mined for contextual information, such as the number of views, comments, and ratings.

–**Cast identification**: taking advantage of research progress in the last decades about automatic face recognition techniques in the field of computer vision and pattern recognition, researchers have developed an application to automatically discover the main characters in feature-length films and TV series and retrieve their associated shots (Fan et al., 2006).

Different video interfaces offer searching and browsing functionalities based on the previous techniques. Current features include keyframe navigation (Hudelist, Schoeffmann, & Xu, 2015), use of surrogates such as single keyframes (poster frames), storyboards (arrays of keyframes), slide shows, and fast forwards (Marchionini & White, 2007); transcript-based search or query by example (Huurnink, Snoek, de Rijke, & Smeulders, 2010). Current research attempts to include audio surrogates created from manual and/or automatic generated spoken keywords (Marchionini, Song, & Farrell, 2009).

2.4.2. CBIR in practice: automatic content metadata extraction in audiovisual archives

Though still far from being perfect, CBIR presents itself as a solution to the problem of the so-called "fine-grained access" to moving images, by offering an "abundant source of automatically generated shot-level descriptions for search" (Huurnink, Snoek, et al., 2010). However, opinions at this level seem to be contradictory, and archivists in audiovisual archives adopt different attitudes to the use of automatic techniques in the indexing process, not always positive ones, as reported by Huurnink, Snoek, et al., (2010).

Huurnink, Snoek, et al., (2010), evaluated if content-based video retrieval systems could be used in a real audiovisual archive. They used logged searches and content purchases from an existing audiovisual archive to create query sets and relevance judgments (in the style of video retrieval evaluations). The authors concluded that content-based retrieval methods were optimal, and that "the time has come for audiovisual archives to start accommodating content-based video retrieval methods into their daily practice" (Huurnink, Snoek, et al., 2010).

In real settings, different audiovisual archives, mainly in the broadcast sector, use information processing systems that incorporate state-of-the-art automatic indexing techniques. De Keyser (2012) presents examples of those archives, for instance, The American Public Broadcasting Service, which uses speech recognition to index news clips. Shot boundary detection is also applied in the broadcast sector, mostly for the retrieval of news shots that are embedded between two "anchor shots", i.e. relatively stable shots with one person sitting in the studio and talking (De Keyser, 2012). Likewise, current applied research in the audiovisual area has shown a great level of quality in automatic indexing for radio programs based on speech recognition and by using Linked Data and thesauri representation through SKOS (as described in §2.3.2.3). One specific case is the application at BBC of an automated tagging algorithms using speech audio as an input, and mappings to web identifiers from the Linked Data cloud (Raimond, Lowis, Hodgson, & Tinley, 2014).

Conversely, the conclusions reached during the VIRAMI project mentioned before (§2.3.2.3 and §2.3.2.5), which also explored whether there was a role for CBIR in audiovisual archives, indicate that, while the techniques offer solution for supporting effective cataloging, they are not enough for answering the researchers needs (Sandom & Enser, 2001, p. 147;150). Sandom and Enser state: "CBIR offers no solutions to the problem that without effective

cataloging, in particular, the provision of subject and content descriptions, the researchers' needs could not be met" (Sandom & Enser, 2001); and that "the formulation and satisfaction of requests for archival footage places a heavy reliance on human intellectual input for which CBIR techniques offer little prospect of being an effective substitute" (Enser & Sandom, 2002). Enser and Sandom also indicate that the most obvious limitation for a CBIR to work supporting the cataloguers in practice, is that not all materials are digitized (this statement was made in 2002, and still holds true to a big extent). The authors explain one of the potential advantages of a CBIR system at a film archive:

> "However, current developments in the field of video retrieval, which provide shot recognition, video parsing, or video skimming, often in tandem with speech recognition, have the potential to considerably facilitate the cataloguers' role, by eliminating the need to watch footage in its entirety by the presentation of a visual synopsis which can be used for detailed subject description. It must be remembered that this will only have application for digitised footage, which at the present time comprises a small percentage of the total holdings in most archives" (p.54).

Apparently, the use of automatic video retrieval is more difficult in the film domain than in the television sector. One example, described by Rüger (2010), observes that one of the reasons for this difficulty is that existence of subtitles (Teletext) in television productions is mandated by specific laws, as opposed to DVDs, which use "subpicture channels for different languages" overlaid on the video stream, which require an extra step of optical character recognition. Additionally, current research has shown that in the case of feature movies, "state-of-the-art face description and modeling methods have had only limited success in real-world testing" (Yeh & Wu, 2014). Automatic face recognition techniques were also found to be limited in the project "Visualizing Vertov" (Heftberger, 2012, p. 218). This difficulty is precisely due to the several composition elements that are involved in a film image: Lightning, settings, poses, and the like; or to problems derived from the digitization of the original film material.

Indeed, full automation may not be possible for content metadata extraction for all types of sources (Gibbon, Liu, Basso, & Shahraray, 2013, p. 628), and human intervention is (still) recognized to be needed in the annotation process in audiovisual archives (Andreano, 2008, p. 95; Jong, 2003, p. 16; Soergel, 2009).

2.4.3. CBIR in practice: automatic content metadata extraction in media research

As Collins et al. suggest, "ever since Jim Gray introduced the idea of large-scale data analysis as the 'fourth paradigm' of research, academics in a range of disciplines have been seeking ways to harness the power of computing to advance" (Hey et al., 2009 as cited in Collins, Bulger, & Meyer, 2012). Scholar Lev Manovich and his "Software Studies Initiative" lead the field of using automatic retrieval mechanisms in visual research. Manovich and his team focus on "methods and techniques for the analysis and visualization of large sets of images, video, and interactive visual media" (Manovich, 2012). They use automatic pattern detection of

images' features for large corpora of images and video. The reasoning behind the use of these automatic techniques, advocated by Manovich are: (1) the enormous amount of media produced nowadays; (2) the problem that human eyes which are not very good at registering subtle differences between images; and (3) there are no names to all of the variations of textures, compositions, lines, and shapes used in large cultural data sets.

Manovich (2012) analyzes the difference between these automatic techniques for image analysis with traditional manual methods used in the humanities. He explains that humanists often use manual "annotation", i.e., a systematic description of selected image characteristics using a controlled number of terms; and/or "content analysis" (the equivalent method as named by communication and media researchers). Manovich observes that this annotation/coding method is more powerful that informal examinations of media, but it is still problematic, since it does not scale to large data sets. The solution proposed by *crowdsoucing* techniques to the problems of analyzing big amounts of images is also analyzed by Manovich, who sees that still the third problem listed above persists in this solution (i.e., the impossibility to name all changes in patterns of form features).

For those reasons, Manovich and the "Software Studies Initiative" propose a series of techniques (e.g., scatter plot, image plot) to analyze big image data sets based on automatic and quantitative approaches, which produce other images (visualizations) that in turn humans can analyze.

In the film domain, one successful application of automatic content analysis is the project "Visualizing Vertov" (Heftberger, 2012), a collaboration between a film archive and two universities with the aim of gaining "new insight into the work of the Russian director Dziga Vertov, who is famous for his highly formalized style of filmmaking, with its spatiotemporal structures and montage patterns that follow complex rules and artistic principles" (p.210).

Finally, one recent project that combines automatic content analysis with other type of data is described in Appendix O.

2.5. Non-information professionals' manual annotations: (social) tagging and commenting

According to the categories presented in

Table 2.1, this perspective consists of gathering annotations through social contributions by casual users*, that is, from people who are not necessarily experts on indexing (but who may be experts in other domains) through the use of social web platforms in which they can contribute their annotations for personal or collective use. Two of the most important forms of social annotations are tagging and commenting, which are reviewed next.

2.5.1. Informal annotations: tagging and commenting

Tagging consists of assigning keywords* to information sources by a person who is not expert on indexing, in a voluntary, generally non-controlled way, often performed in online information environments such as social media sites, or for personal use in personal desktops or organizational information systems.

The main difference with professional indexing (as explained in §2.3) is the provenance of the annotations: non-information specialists in the case of tagging (but who may be experts in other domains), and information specialists (indexing experts) in the case of indexing.

One of the key issues in this context of user-generated content (UGC) is the control and assessment of quality and trust. There are several approaches to guarantee these requirements, both from the moment in which the annotations are created (e.g., in guided tagging), or in subsequent processing (e.g., "tag gardening" initiatives). There is active research about provenance information for web data (Wylot, Cudre-Mauroux, & Groth, 2015), and a few investigations about how to implement the use of annotations' provenance information: for example, a study about displaying source credibility information for multiple cultural heritage sources (Amin, Zhang, Cramer, Hardman, & Evers, 2009), and about the use of weights for subject entries and tags (Zhang, Smith, Twidale, & Gao, 2011). Current research is progressing in developing automatic quality metrics to accurately measure the contributions/annotations of users, or algorithms that incorporate provenance information into the tags' trust evaluation (Ceolin, Nottamkandath, & Fokkink, 2014).

Another way of adding user annotations to web resources are comments. **Commenting**, though, has not been studied to the same extent as tagging. Park et al., (2008, as cited in Madden, Ruthven, & McMenemy, 2013) found five categories of user-contributed comments in the "Digg" and "del.icio.us" sites: "summary", "additional information", "impression", "opinion", and other. Jansen et al., (2009, as cited in Madden et al., 2013) also categorized comments in 23 different types, in this case applied to the study of social networks such as "Twitter"; some of their categories, according to Madden et al. could be applied to comments on a broader variety of topics. Investigations related to YouTube comments are reviewed by Madden, Ruthven, & McMenemy's (2013): Thelwall et al., (2011, as cited in Madden et al., 2013) studied the length, topic and sentiments present in the comments, finding that the "typical YouTube comment was mildly positive", and that there are different audiences groups, ranging from those who engage in passive entertainment to those to participate in debating. Similarly, Siersdorfer et al., (2010, as cited in Madden et al., 2013) in an in-depth study of commenting and comment rating behavior on a sample of more than six million comments on 67,000 YouTube videos, found a strong connection between different kinds of sentiments expressed in users' comments with the topical content of the videos. Madden's (2013) study is also about the types of comments in the video-sharing platform Youtube. The authors found ten broad categories and 58 sub-categories in their classification schema, the ten categories being: "information, advice, impression, opinion, responses, personal feelings,

general conversation, [or] site processes (e.g., commenting on the action of posting videos, or requesting a video to be posted)."

Even though tagging activities as such can be performed offline and/or for a single individual use in the context of personal information management, they are often associated with the idea of collective contributions through social sharing websites. In that sense, social tagging is seen as a form of *crowdsoucing* (§§ 1.2; 2.6). From the managerial point of view, planning and implementing *crowdsoucing* projects is a challenging task for cultural heritage institutions, used to rely on the processes of information annotation carried on by information professional experts (§2.3). their research project "Modeling *Crowdsoucing* for Cultural Heritage" (MOCCA)[35], in which they intended to investigate the organizational factors that influenced the failure or success of a *crowdsoucing* project driven by cultural institutions. The authors concluded that there were six "pillars" that could help project managers to state better the goals of *crowdsoucing* projects, which are: "institution", "collection", "goal", "crowd", "infrastructure", and "evaluation." These results are highly relevant for the considerations about *nichesourcing* initiatives. The topic will be discussed later (§3.5.1), and at the final chapter of this thesis.

2.5.2. Non-information professionals' annotations in the audiovisual (heritage) domain

In the cultural heritage domain, social tagging has become an attractive solution to involve the public in the process of describing the objects in digital collections (Oomen & Aroyo, 2011). For example, the Steve museum social tagging project collected a large number of tags that describe artworks (Trant, 2009a).

State-of-the-art research in automatic moving image access can achieve content-based indexing based on the images' low-level features, and concept-based indexing based on derived high-level concepts (Stock, 2010). However, the level of performance is still not optimal to be used in all settings (Gibbon et al., 2013; Yeh & Wu, 2014). Different techniques for semi-automatic concept-based indexing at the shot level have been investigated by Turner (2009) though they only apply at a small scale. But socially generated tags (by niche groups and by the general crowd), if well guided, could help to bridge the gap between: (1) content-based and concept-based annotations (as promulgated by Enser, 2000; and explored in Freiburg, Kamps, & Snoek, 2011; and Melenhorst, Grootveld, van Setten, & Veenstra, 2008) and (2) different concept-based annotations created manually (as different studies with tags have shown, such as Lu, Park, & Hu, 2010; Matusiak, 2006; and Springer et al., 2008).

In the audiovisual domain, social tagging research has focused its attention mainly on recommendations of entire videos or movies based on tags and user profiles (for instance in the work by Bertini et al., 2013a, 2013b, and Gedikli & Jannach, 2013), and in video classification based on tags (for instance in Huang, Fu, & Chen, 2010). In turn, the music

[35] A collaboration between the University of Amsterdam's Centre for Cultural Heritage and Identity, the Amsterdam City Archives, and Picturae, a creative industry company that specializes in digitizing cultural heritage collections.

sector has recognized the advantages of social tagging in connecting users, not only for passive consumption but as a way of engagement with other users, as an illustration, Voida et al. (2005) argued that "one of the greatest challenges for technical innovation in music sharing may be in allowing designers to make the leap between treating music sharing technologies as personal music listening utilities and treating music sharing technologies as online communities" (p. 200).

Other *crowdsoucing* initiatives in the audiovisual sector are presented by López de Solís and Martín-López (2011) (see also Appendix N). In the film domain, successful experiences in using descriptors have been already gained in the area of what Fossati calls the "creative re-use of, or inspiration by archival material" (Fossati, 2009, p. 96), like the "Celluloid Remix contest"(rw), and "The Scene Machine"(rw), which allow users either to creatively explore online archival film footage relying upon keyword-based search, or to create their own content making use of the existing labels. However, these keywords are not socially generated, but provided by the coordinating institutions. They also do not seem to be based on specific studies exploring how they could be generated in a social tagging setting for moving images.

Even though social tagging has many recognized advantages, it also has drawbacks from the information organization point of view, due to the way tags are created: by non-information professionals in a spontaneous and informal way. In general, there is consensus in that socially generated tags have quality problems associated with the use of non-words, polysemy, synonymy and lack of hierarchy (Guy & Tonkin, 2006; Matusiak, 2006; Lu et al., 2010), and to the lack of distinction of which type a tag corresponds to (Springer et al., 2008, p. 18). In the case of fixed image indexing, the existing problems for text indexing can be even multiplied (Matusiak, 2006, p. 294) due to the semantic richness and ambiguity inherent to pictorial representations (see also §2.2.3 about the problems associated with moving image annotation).

However, the advantages that social tagging brings in engaging audiences and augmenting awareness of heritage collections (Springer et al., 2008), or in creating different access points (Lu et al., 2010, p. 764; Thøgersen, 2013) that help increasing indexer-searcher consistency, or in complementing automatic annotations (Freiburg et al., 2011), are sufficiently promising to look for solutions to surpass those disadvantages. Social tagging also adds to the appealing possibilities of using *crowdsoucing* as a way to complement the recognized lack of available information experts that could index the huge amount of digital information (Lu et al., 2010, p. 764). For these reasons, there is active research in finding ways of improving the quality of tags, of which *nichesourcing* is one of the main initiatives. Besides involving domain experts, research on the context of LOD seeks to improve the use of underlying controlled vocabularies for tag recommendation or assembling (Hildebrand, van Ossenbruggen, Hardman, & Jacobs, 2009; Lykke, Hoj, Madsen, Golub, & Tudhope, 2012; Matthews et al., 2010), and to create applications that make use of "semantic social tagging", as explained by Good, Tennis, & Wilkinson (2009, p. 14).

Furthermore, a relatively new phenomenon in the creation of tags is their creation in professional settings. For example, Fleischer and Backe (2011) explain that at the Norwegian Broadcasting Corporation (NRK), "internal users", meaning the workers at the archive who are not necessarily responsible for cataloging and indexing, are taking over these tasks by providing tags during the media production chain. The role of the information professional, reflect Fleischer and Backe, is to "take ownership of the metadata", that is, that of providing guidelines for those users to create the tag, and carry on quality control mechanisms after they are produced. This use of "social tagging" within smaller organizational contexts, could be considered as a case of "insourcing", according to the categories proposed in a study about 3D collection management by cultural institutions (Kaminski et al., 2012). The three categories proposed by the authors are "insourcing," through developing the skills of in-house staff within an organization; "outsourcing," by using external professionals; and *crowdsoucing*.

Finally, in relation to commenting, an early study by Van Hooland (2006) in the visual cultural heritage domain, analyzed the quality of user comments to the National Archives of the Netherlands digital collection, launched in 2004, and containing approx. 500,000 images back then. The analysis was performed in terms of relevance for the user community, through a comparison between the users' queries to the archives, and the comments' main content (categorizing both using the matrix proposed by Shatford, 1986; §2.8.3). Van Hooland evaluated a sample of 355 comments (from the total 4647 comments in the database), concluding that there are several types of comments (i.e., critical comments, narrative elements, personal stories, opinions, dialogs or questions, or problems related to display). This study seems to be one of the few that also explains how a cultural heritage institution (in this case in the visual domain) deals with "comments" as a form of casual users' contributions.

2.5.3. *Nichesourcing* in the audiovisual domain

Nichesourcing is defined by its authors both as a form of *crowdsoucing*, and of human computation (§§1.2,2.6) (De Boer, Hildebrand, et al., 2012). The two initial projects that are identified as cases of *nichesourcing* (Boer et al., 2012) addressed problems related to: classification (and indexing) (i.e., "The Rijksmuseum prints annotation" project); and, transcription (i.e., a digitization related project, part of a bigger effort for regreening in Africa).

In the first case, there was a need for computational support in making the annotation process of a print collection at the museum more efficient, where each print needs to be annotated by information professionals. Its subject matter could only be described with high precision by experts in a domain (e.g., zoology, biology, or Japanese culture), since the prints depict several types of objects that an indexing expert may not necessarily be expert on. The solution consisted of developing a dedicated information processing system for supporting the annotation task, called "Accurator"$^{(rw)}$, which enables anonymous niche groups on the

web to complement the work of the museum professionals through the expert annotations that they provide. To date (2015), this system is still under development, and the related research work is focusing on these areas: finding relevant experts and ways to motivate them, refining personalization mechanisms, and developing strategies to evaluate quality using trust algorithms.

The second project mentioned above is developed in the framework of the "Web alliance for Regreening in Africa" (W4RA) project. In this case, the *nichesourcing* solution addressed the problem of transcribing a group of manuscripts with weather data from African countries written in different languages and complex hand-written tables. The proposed solution was to look for niches of African people living abroad, who could not only understand the original language and French, but have knowledge of the regions and culture that could help them in "decoding" difficult handwritten styles and document structures. A dedicated information processing system on the web was also developed to collect the annotations for the project, subsequently evaluated (Tesfa, 2012).

The most important *nichesourcing* initiative in the visual and cultural heritage domain is "The Rijksmuseum prints annotation" project described above. To our knowledge, there are no *nichesourcing* initiatives applied to audiovisual heritage or to the annotation of moving images in the broader cultural heritage field to date.

In a broad understanding of the term, as a way of engaging domain experts, *nichesourcing* could fit into the perspective called "community-sourcing" (Sample Ward, 2011, as cited in Voss, Wolfenstein, & Young, 2015). This could be framed also in broader initiatives of community engagement. There do not seem to be reports about this activity by film or media archives, except as part of cross-national projects to engage expert users with collections (§7.4.4.2), or as part of broader media-related events addressed to researchers (§2.8.1). At a general project management level, Dombrowski (2014) insists on the need to recognize that community engagement requires longer time-frames and more complex strategies than expected. Voss et al., also indicate, that: "building trust, recognition, and a culture of sharing in the community is a must, and once that is established, it will yield results", but this has to be part of a long-term planning. At a general project management level, the previous sources indicate that community-sourcing projects require engagement with key leaders in the niche groups in order to build trust, and co-designing the project with the community to guarantee a shared vision among all stakeholders.

2.5.4. Content annotation levels from a non-information professional perspective

Most initiatives that allow general users (i.e., non-information professionals) to annotate web content offer this possibility at the item level. This means that tags or comments are usually associated with entire videos or films (for example in the IMDB plot keywords) [(rw)]. However, initiatives coming from the domain experts, more specifically from film historians, also include the possibility for individuals to share their annotations at a shot level, as in the

aforementioned project "Cinemetrics" [rw]. Also, online video sharing services offer the option of adding timestamps, overlaid text, subtitling, and commentaries.

In spite of the existence of practical applications, different authors have recognized that there is little research on the area of tags applied to a time-based level. On a practical side, implementations of social tagging using a time-based approach are starting to appear in the audio domain, for instance with the BBC "Find, listen, label" tool for adding notes to radio programs[rw], or the Larm Project in the radiophonic cultural heritage which gives prominence to user-driven annotations (Skov & Lykke, 2012). Similarly, within the specific field of film studies and media analysis, there is an intense activity in relation to annotation aided by digital technologies; the most significant example is "Cinemetrics", which works as a collaborative project in which users share their analysis on shot lengths, scale or compositional patterns (Tsivian, 2009). This and similar applications are, however, not yet accompanied by academic inquiry from the LIS and related disciplines, where there are no studies about the use of time-based tagging as a form of moving image indexing in the audiovisual heritage domain. This may be due to the fact that audiovisual archives have just recently begun to digitize their collections and share them online (Fossati, 2009). The few exceptions to this lack of research include an early study about tagging applied to the movie recommendation service "MovieLens" (Sen et al., 2006); the studies carried out by Geisler, Willard, & Whitworth (2010) part of a larger effort to develop a framework for the *crowdsoucing* of film and television indexing, which is most related to this thesis work; the study by Freiburg et al., (2011), that looks at the time-based metadata approach in combination with socially generated tags and automatically created annotations to video fragments of music concerts, and the studies done in the framework of the *"Waisda?"* project. This will be investigated in more detail in Chapter 5.

2.6. Semi-automatic annotations in human computation settings

This perspective is defined as a way of creating annotations using a combination of automated techniques and human input. According to the categories presented in

Table 2.1, the annotations generated in this way are created by people with no specific (or unknown) level of indexing or domain expertise (except if explicitly sought), often anonymous, who are assigned small tasks. Thus, the level of participation is high. The annotators may or not have familiarity with content, or interest in the sources, or stewardship concerns, but those who design the semi-automatic setting do. The level of control and representation of the terms used to annotate the documents may vary depending on the overall task.

2.6.1. Definition of *nichesourcing* as a form of human computation

Human-based computation, or simply "human computation" is one area of human-computer interaction (HCI) research interested in providing insights and solutions to common artificial

intelligence (AI) problems for combining the processing power of computers with human capacity by enabling online human participation in the computational process (Quinn & Bederson, 2011). The modern use of the term was proposed by Luis von Ahn in his 2005 Ph.D thesis, motivated by the idea that despite the significant advance of computers in the last fifty years, some trivial tasks for humans, such as image recognition, were not yet possible to accomplish by the most sophisticated algorithms. Ahn explains that the traditional approaches have focused on improving those algorithms, while his method consisted of providing organized structures to benefitting from human skills by channeling human input obtained while they perform other activities, such as for instance playing games (Ahn, 2005). Ahn defined 'human computation' as "computation that is carried out by humans", and 'human computation systems' as "intelligent systems that organize humans to carry out the process of computation" (Law & Ahn, 2011).

One well-known example is the initiative called "reCAPTCHA," in which web users are requested to enter certain characters that have been previously distorted, to prevent automated programs misusing the services. This is based on the idea that humans can perform tasks that are difficult or impossible to achieve for computers. Ahn, Maurer, McMillen, Abraham, & Blum (2008), showed how this simple security task could be channeled into a useful purpose, that of helping to digitize old printed material by asking users to decipher scanned words from books that computerized optical character recognition had failed to recognize.

Ahn's proposals have initiated an active research field, which covers several of the so-called "AI problems" identified by Law and Ahn, such as "perceptual tasks (e.g., object recognition, music classification, protein folding), natural language analysis (e.g., sentiment analysis, language translation) and complex cognitive tasks (e.g., planning and reasoning)" (Law & Ahn, 2011). To date, there are several applications of human computation, and its delimitation as an area of study usually overlaps with other areas, such as *crowdsoucing*, "social computing", and "collective intelligence" (Law & Ahn, 2011). Quinn and Bederson (2011) proposed a taxonomy with the purpose of clarifying the commonalities and differences between human computation and those related fields. Figure 2.5 shows the scope of these terms, as defined by Quinn and Bederson.

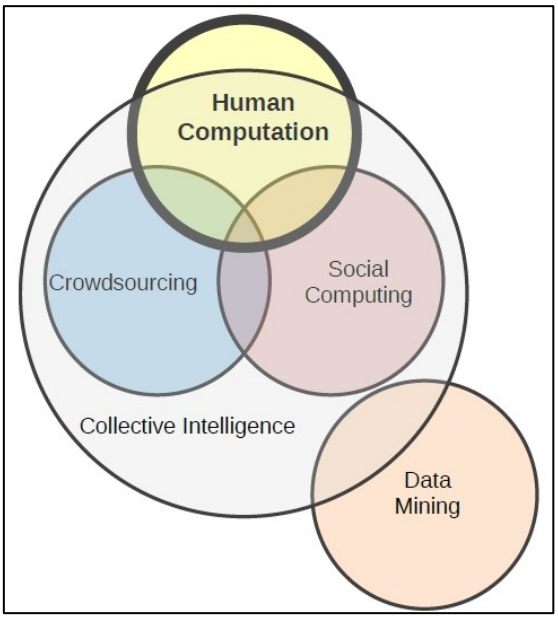

Figure 2.5. Human computation and related areas (Quinn & Bederson, 2011).

There are several forms of human computation. Quinn & Bederson (2011) proposed a categorization based on seven dimensions (i.e., motivation, quality, aggregation purpose, human skill, the time required for the participation, and cognitive load). Their resulting genres or categories of human computation include:

- **Games with a purpose** (GWAP): term proposed by Law & Ahn (2011) in which people perform computational tasks while playing games, being motivated by the fun in the game. This type is investigated in one of this thesis studies (Study A).
- **Mechanized labor**: The tasks are done for monetary reasons. The best example is Amazon Mechanical Turk, in which people can perform small tasks and get paid micro-sums for each task, and are thus motivated to accomplish many.
- **Wisdom of crowds**: it consists in asking big amounts of people to make judgments, which are used in pooling opinion or calculating probabilities that for a single person would be impossible to calculate. One example is Ask500People[(rw)].
- ***Crowdsoucing***: contrarily to "mechanized labor" the motivation for performing a task is curiosity, serendipity or willingness to cooperate with no obligation. Examples presented by the authors include Askville[(rw)], and Aardvark[(rw)].
- **Dual-purpose work**: it consists of using automatic mechanisms that are already in place, in order to benefit another task. The best example is the mentioned ReCaPTCHA project[(rw)].
- **Grand search**: in this form of human computation, people perform a search in order to find a required result, for example, the search for tiny matter from space in the Stardust@home project[(rw)].
- **Human-based Genetic Algorithms**: applied to the evaluation of genetic sequences and mutations consisting of sequences of small parts.

- **Knowledge Collection from Volunteer Contributors (KCVC):** aggregation of common knowledge or common sense facts from humankind, for example, "The Open Mind Common Sense Project."

Within the categories of human computation shown above, *nichesourcing* would be placed in the *crowdsoucing* type. Indeed, *nichesourcing* has been defined by its authors both as a form of *crowdsoucing*, and of human computation (De Boer, Hildebrand, et al., 2012) as indicated above (§2.5.3). The two reported *nichesourcing* projects to date are related to other the initiatives in the *crowdsoucing* domain that attempt "channeling" the uncontrolled efforts of the "crowd" in order to improve the quality of tags (for instance through guided tagging (§5.3.4), "tag gardening" (§2.5.1), by setting up mechanisms for the process that make the users provide their input in a more structured or guided way. This makes *crowdsoucing* annotation-related activities, i.e., those that address classification and correction/transcription, very close to human computation. Similarly, there are human computation applications to the tasks of classification and annotation, for instance, through "metadata games" [(rw)].

Even though the distinction between *crowdsoucing* and human computation is blurred, a key necessary distinction is necessary, in order to avoid confusion during the design or implementation of *nichesourcing* initiatives by cultural heritage institutions: human computation is mostly about having people (whether casual users in the crowd or niches of experts) performing an activity that could eventually be done automatically through computers, but that these cannot yet do (i.e., replacing computers with humans); while *crowdsoucing* is about channeling these groups to perform activities that require collective effort or intelligence, and may be beyond computerized solutions, or necessary for other purposes that do not have a human computation focus (for example, raising funding, providing a personal story, or giving a personal opinion). Furthermore, *crowdsoucing* can be just one of the different methods or tools that human computation can use for distributing the tasks (Law & Ahn, 2011).

An important concept related to human computation is that of "atomic task." The research project "Modeling *Crowdsoucing* for Cultural Heritage" (MOCCA) (Noordegraaf et al., 2014), which studied the factors of success or failure in *crowdsoucing* projects, confirms the fact that one of the "pillars" of a project aiming to implement *crowdsoucing* initiatives, is the evaluation of task complexity ("the atomic task"). The authors also suggest that the tasks should be designed in a variable way, in accordance with the experience of the participant with each specific project. For example, if the same person is repeatedly performing the same task, it needs to be progressively more challenging. An additional common characteristic to the *crowdsoucing* and human computation classificatory tasks is that people performing them must have "conscious role in determining the outcome" of their task (Law & Ahn, 2011).

The current activity in the "digital humanities" field gives rise to what Hauttekeete et al., (2011) describe as an interest in developing intelligent IR systems that can support the combination of different types of human expertise with automatic and semi-automatic

metadata generation, this is precisely what the *nichesourcing* initiative is about, and what could define it as an "evolution" of *crowdsoucing* for "classification" tasks. Recent research in relation to system implementation is conducted by Dijkshoorn, Oosterman, Aroyo, & Houben (2012), who show that this can be achieved through "intelligent task routing", which consists of "matching people with appropriate tasks" (Cosley et al., 2007, as cited in Dijkshoorn et al., 2012). The authors propose the design of a system that fully supports the annotation workflow in which different types of annotators (with different indexing and domain expertise levels) involved. They propose four steps in the workflow: (1) identify object to annotate, (2) assign objects to annotate, (3) support annotation of objects and (4) assess quality of objects).

Presenting a typology of *nichesourcing* initiatives is not yet possible since it is an emergent field of study and practice. However, there are several efforts to categorize *crowdsoucing* projects on the web (e.g., Doan, Ramakrishnan, & Halevy, 2011), that could inform further developments in mapping up existing, forthcoming or potential types of *nichesourcing* applications.

2.6.2. Human computation in the audiovisual domain

A most common form of human computation used in the audiovisual domain to date is Games with a Purpose (GWAP), as defined above. In the visual domain, there are foundational tagging games for fixed images, such as the ESP game[(rw)]. In the audiovisual domain, the first initiatives of using GWAP reported in the literature were "PopVideo" [(rw)], and "Yahoo! Video Tag Game"[(rw)], both engaging players in adding tags in a time-based fashion, and getting points for matching tags; or BBC's "Mooso" [(rw)] in the music domain (Oomen et al., 2010). In this thesis work, Chapter 5 focuses on this type of human computation by presenting a study using a similar video labeling game, called *"Waisda?"*

In this line of GWAP initiatives, also in the visual domain, Traub, Ossenbruggen and Hardman (2014) explored how a human computation game could be used to influence the quality of the tags obtained from novices ("the crowd"). In this game, non-domain experts were guided to perform and "learn" to perform expert tasks, such as categorization of paintings into subject types. Even though this approach has common goals with *nichesourcing* in that both seek to look for mechanisms to create high-quality annotations that could be used in a professional environment, it differs from *nichesourcing* in that it does not target niches of experts, but bigger groups of novices that can be trained to perform the expert task.

In a commercial setting there is one important initiative in that could be regarded as a hybrid approach to *"nichesourcing."* It is the case of Netflix described before (§2.3.3), Madrigal (2014) explains:

> "Using large teams of people specially trained to watch movies, Netflix deconstructed Hollywood. They paid people to watch films and tag them with all kinds of metadata. This process is so sophisticated and precise that taggers receive a 36-page training document that teaches them how to rate movies on their

> sexually suggestive content, goriness, romance levels, and even narrative elements like plot conclusiveness. It's where the human intelligence of the taggers gets combined with the machine intelligence of the algorithms. There's something in the Netflix personalized genres that I think we can tell is not fully human, but is *revealing* in a way that humans alone might not be."

This could be considered "hybrid" case of *nichesourcing*, since it uses a human computation approach (i.e., by combining "human intelligence" with "machine intelligence"[36]), a dedicated team of people financially rewarded (similar to the "mechanized labor" type mentioned in §2.6.1), who have to be trained to become experts (probably hired by the company, thus being a case of "insourcing", §2.5.2), in order to create fine-grained annotations for providing recommendations based on the so-called "microgenres". Even though this example is used in this chapter with only the purpose of providing an overview of current initiatives, it confirms the need for using unique human expert capacities of judgment and understanding to push the possibilities of "indexing" moving image content to the limit for accomplishing strategic (in this case commercial) goals.

2.7. Annotations created in the context of multimedia creation

This perspective includes annotations (or documents) generated by the moving images' authors or creators during media or film production. Indeed, different types of annotations are created during those processes which can become sources of information about the moving images and facilitate future access. Ingwersen & Järvelin (2005, p.266) also indicate that authors also provide representations, or "author aboutness" information.

According to the categories presented in

Table 2.1, the annotations' dimensions in this perspective are characterized by a low level of automation, a high level of source authorship, familiarity and interest in the source but a low level of stewardship for the future re-use of the sources being produced. The author performing the annotations may or not have indexing expertise and the level of terms control and representation may be loose. The level of participation in the creation/annotation process may vary from individual to collective (e.g., from group to individual productions).

It is important to clarify that audiovisual productions may take place in broader institutional settings (e.g., a broadcaster); in those cases automatic or professional metadata is created along the media production chain. The perspective presented in this section refers to annotations or metadata produced as part of the production process, not necessarily with the professional aim of facilitating retrieval.

In the particular case of narrative films, film theories define at least four stages in their production. As Guynn (2010) explains, each production phase contributes to the structures and meanings of the story. He summarizes the stages in: (1) the production of the film script;

[36] Also through mining relations in usage data.

(2) the preparation for the 'shooting' or 'mise-en-scène'; (3) the 'shooting' itself; and (4) the editing stage.

From the preliminary ideas to the editing stage, it is possible to think of a film production as a collective construction in which a great variety of derivative or accompanying documents is created simultaneously (e.g., the script, the shooting script, storyboards, or edit-decision-lists). Most moving image archives or production companies may keep these documents in their files; even though they may not be easy to access in certain cases, as reported by Turner & Colinet (2005). These authors proposed a method for indexing moving images at the shot level by linking shooting scripts (in which the sequences or scenes are broken into shots) to the moving images. Besides this linking, Turner and Colinet (2005) propose using other types of textual information, such as closed-captioning for the hearing impaired, audio description (also a technology for the vision impaired), and textual descriptions, in this case written for each shot as part of the research analysis performed from video cassettes by the authors of this study.

The previous method was applied to a single production. Thus, Turner and Colinet call for further research to validate their findings. They conclude that apparently, "the shooting script is not a very rich source of keywords that can be used to generate indexing to the moving image, especially at the shot level." They state the need for reconsidering the shot as the unit of indexing since sequences seemed more appropriate instead. The study by Turner and Colinet is part of a broader project that investigates the contribution each of these textual sources makes to the overall moving image indexing process (Turner and Colinet, 2005).

However, finding these textual sources may not be easy. Simpson-Young and Yap (1995) report that screening notes created by filmmakers are not often made available to other people. Some of the participants in their study expressed the need for increasing the availability of shot lists and transcripts at film libraries (p.5). Also, in case that these textual sources were available, that would be only in the case of commercial or big productions, not for productions made by individuals on a small scale. Indeed, approximately since the 1960's, when Kodak releases the first Super 8 camera, amateur filmmakers have been recording home movies, most probably without scripts or textual derivatives. Since the appearance of the first video camera recorders ('camcorders') in the early 1980's, and the beginning of massive use of personal computers in the 1980s and 1990s, individuals have the possibility of producing and editing moving images themselves, by using digital capture or digital intermediate processes in completing their own productions. Current storage capacity and software functionality allow the digitization and editing of a wide range of multimedia documents in personal computers, as well as video recording and editing in web-based systems that facilitate sharing and online streaming. In the open web, the creators may add their own metadata, in the form of tags or comments (§2.5), and other automatic metadata can be embedded in the objects, but scripts or other textual documents may not exist or be easily available.

Even more challenging for this annotating perspective is that more complex ways of

producing videos call for equally multi-modal interactions and annotation forms. Cattelan et al., (2008) investigated a way of providing annotation support in authoring tools for interactive videos based on capturing voice comments over individual frames and segments of the videos, and on the use of digital ink for the annotations to the digital videos. The "watch and comment" functionality presented by these authors, keeps similarities with personal annotations to textual documents. However, current digitally made films may facilitate this synchronization task of author/production generated documents with the moving images. Guynn (2010) explains how digital technologies used along the production process create "an interface between literary representation and cinematic visualization" (p.61), as well as the "recording" of the editing process.

Another potential source of annotations from this authors' perspective, similarly to the case of music interpretation, in which scores are heavily annotated (Winget, 2008), would be the annotations made by performers during the rehearsal process (Abbott, 2008). However, within the literature reviewed in this thesis, there was no evidence of research about using these types of actors' annotations for indexing films or other moving images.

Even though annotations in the media production process are multiple, there is an inherent problem associated to their re-use. This problem has been studied by Luckow and Turner (2008) through a case study of a motion picture studio. They found that even though there are different "media windows", that is, markets in which media could be made available and reusable for consumers, media production companies do not seem to be aware of the need of preserving or archiving the documents produced along the chain. Luckow and Turner argue that "the traditional neglect of potentially useful archival materials on the part of the movie studios is carried over into the digital world." They also claim that implementing good archival practices would be beneficial for the production companies themselves, and also would give a new unexplored dimension to film archival practices of cultural heritage preservation, which often are not placed in the initial stages of a media production.

In sum, even though authors' multimedia annotations could be a very rich source for moving image access, they are difficult to obtain. However, in addition to the aforementioned documents created during authoring and production process, there are several accompanying texts that serve the purpose of advertising and distributing activities of a released film or media work, which by principle are made publicly available. Stanitzek (2005) calls these documents "cinematic paratexts." The concept of paratext* is discussed in Chapter 6 (§6.6).

2.8. Annotations created in the context of multimedia analysis in research and education

This perspective includes annotations (or documents) generated by the researchers during moving image analysis activities, generally through information processing systems*. Different types of annotations are created during those processes which can become sources of information about the moving images and facilitate future access. Certainly, researchers

who analyze the finally produced media also generate a variety of related documents (e.g., shot analyses). At this level, it can be assumed that the amount of manual annotations (on paper and personal notes) may surpass their digital (and online) equivalent. This perspective also includes the abstract, conceptual models that become frameworks for the annotations of image content, usually from a subject-based perspective.

According to the categories presented in

Table 2.1, the annotations' dimensions in this perspective are characterized by the fact that they are created by domain experts, i.e., scholars or researchers with a high level of familiarity with certain area, thus with the content of documents, and a high level of source familiarity and interest in the source. These annotations have a low level of automation. The actor performing the annotations may or not have indexing expertise and the level of terms control and representation may be loose. The level of participation may vary from individual to collective (e.g., in group or individual analysis work).

2.8.1. Teachers and researchers' annotations

Haslhofer (2009) indicated that the number of personal annotation systems is growing (Haslhofer, 2009), and Sanderson et al. (2013) identified more than fifty. The work of Marshall (1997) is a pioneer in this respect. She, as a system designer, carefully observed the forms and functions that annotations of paper textbooks had for university students, calling for better design of annotation tools that could support a smooth integration of annotating with reading in a digital environment. Marshall (1997) showed that until then most research on the annotation of electronic texts was centered on how to support group or collaborative writing, but not so much on personal annotation support.

Currently, bookmarking websites, highlighting and commenting text or *pdf* documents are common practices, supported by different –though not interconnected tools. About this, there is an emergent interest, domain centered, in supporting initiatives for annotation tools development. One important example is the "Hypothes.is" Project (Waters, Cullyer, & The Andrew W. Mellon Foundation, 2014) which has received an award from the "Scholarly Communications Program" of the Andrew Mellon Foundation in order to develop an open source platform that implement annotation services in the context of scholarly collaboration.

On the technology side, current efforts are driven towards creating standards that facilitate interoperability in the web (mentioned in §2.3.2.4), or for investigating the design of information processing systems that support digital annotations. Intensive work is done by Agosti and her team, who have published numerous papers on the topic (e.g., Agosti et al., 2013).

Researchers and educators can use current technology affordances in order to add personal annotations to multimedia objects and perform content analysis (e.g., annotating or coding). Commonly used software in research and educational settings are called Computer Assisted

Qualitative Data AnalysiS (CAQDAS) or qualitative data analysis (QDA) software (Bazeley & Jackson, 2013). First created in 1994, these are common tools used by researchers in order to perform qualitative (content) analysis through coding. Current developments include the possibility to perform analysis of audio recordings, video footage, and digital photos. Software for qualitative analysis also includes options for annotating videos at the item and shot-levels (item to time-based or specific parts of an image). These resources can be coded (i.e., get different keywords defined by the user), and interlinked. These packages (such as "NVIVO", or "Atlas.ti") include advanced controls for facilitating the annotation activity during visualization (e.g., adding time-stamps, real-time summaries, keywords, transcripts, etc., and playing back, forward, pausing and speed control). In the case of audio and video, transcripts can be imported and synchronized. These programs are often used in the social sciences to facilitate researchers keep their documents in a single location, interconnected in different ways. Similarly, in the sciences, there is also an emergent interest in designing suitable "research notebooks" used in labs (Giles, 2012), which also support the annotation of video documents.

Several "tools" support time-based annotations for analysis purposes, for instance, the program "Synote"[(rw)], a time-based, and web-based annotation software designed to facilitate personal audio annotation. Also, a series of "tools" developed at Harvard University (e.g., "Open Video Annotation", and "Collaborative Video Annotation tool" and other "annotation projects at Harvard" [(rw)]) intend to support academics in video annotation for education and research.

Manovich (2012) indicates that the author who pioneered the use of manual coding/annotation for the analysis of visual media is Barry Salt. As Manovich explains, "he annotated all shots in the first 30 minutes of a few hundred twentieth-century feature films using a number of characteristics: shot scale, camera movement, and angle of shot. [… He] used a small number of categories for each characteristic. For example, possible camera movement types were pan, tilt, pan with tilt, track, and so forth [… he] also recorded shot duration. A current information system that supports this type of analysis, and also sharing the resulting annotations, is the aforementioned service "Cinemetrics" (§2.5.2).

Other examples that facilitate automatic video annotation combined with manual coding include "Videana" (Ewerth et al., 2009), which allows researchers to perform "shot boundary detection, camera motion estimation, detection and recognition of superimposed text, detection and recognition of faces in a video, and audio segmentation." Another example is Anvil (M. Kipp, 2014), an annotation tool that can be used for video annotation and automatic visualization of recordings of human motion.

Also, Geisler et al., (2010) list a series of projects undertaken by film scholars to benefit from digital technologies in research and mostly in education: early initiatives focused on specific directors or films, such as "Digital Hitchcock" (1990)[(rw)], "The Rebecca Project" (1995) [(rw)]; subsequent initiatives such as "The Virtual Screening Room"[(rw)], which used time-based access based on synchronization with transcripts in an educational setting; or "Movie

Browser" (rw), also based on shot-based segmentation for educational purposes. Other media-annotating projects for supporting teaching and research include the "MovieBrowser" (Alan & Smeaton, 2009, as cited in Geisler et al., 2010); or "Clipper: Enhancing Time Based Media for Research,(rw)" a collaboration between The City of Glasgow College, The Open University and Reachwill Ltd., funded by JISC.

López de Solís and Martín-López (2011) also identified educational services provided by audiovisual archives around several forms of annotation support. For instance, the BFI's "Screen online" project(rw), which offers editing facilities; or "The Living Room" (rw), by the Museum of Moving Images in the US, which allows users to edit spots of presidential elections by adding music, photographs, and sound effects. Indeed, different media are often annotated by individuals for their specific purposes, for instance, education or research (§2.8).

Also, media itself (e.g., a photograph, an audio fragment) can also become forms of annotating other sources. Indeed, Ovsiannikov et al. (1999, as cited in Haslhofer et al., 2009) define an annotation as "a datum created and added by a third party that can take the form of a written note, a symbol, a drawing or a multimedia clip."

In their role of disseminating knowledge among their user communities, libraries have also noticed the increasing facilities provided to researchers for annotating audiovisual sources, starting to promote activities around this topic, or to offer specific systems that can support them. The French national library offers a unique example with a workshop, "Pratiques de l'annotation video"(rw), in which new technologies were demonstrated, encouraging discussions about the new ways to read and research audiovisual works.

2.8.2. Collaborative annotations

Even though the previous annotations can be created during group projects, there are several initiatives that focus specifically on providing support to groups by designing collaborative information systems. This is one of the areas of study of "social computing", as shown in Figure 2.5). **Social computing** is a cross-disciplinary research and application field that combines several areas from computational and social sciences in order to support social interaction and communication through computers, and to support collaborative work and online communities (F.-Y. Wang, Carley, Zeng, & Mao, 2007). Thus, social computing is broader in scope than human computation.

Such collaborative systems, or "collaboratories", support work in groups and the integration of several types of annotations. For instance, Schroeter et al., (2003) designed a system that could support indexing, browsing, and several forms of annotations performed in a real-time sharing platform by multiple people located in different places, who also could discuss via video conferencing. The term "laboratory" was already applied to humanities research by Stone in 1982. This idea is in line with studies about the new role of information processing in supporting science and scholarship (Gradmann, 2013), and was anticipated by Wilson (2010)

when he stated that collaborative systems are seen as “the future” of information work.

This opportunity of supporting collaborative work through the design of “collaboratories” has not been overlooked by film archives. Indeed, the project reported by Hertzum, Mark Pejtersen, Cleal, and Albrechtsen (2002), intends to propose a collaboratory for enabling collaboration in the curatorial work of separated film archives. In relation to research support, the “Collate” project described by Thiel et al., (2004) intended to create a web-based research collaboratory for European film archives, in order to support researchers working with digitized historical material. There is no evidence of the current state of these two projects, though.

One recent existing collaboratory project in the audiovisual domain is “The Larm Project” (Skov & Lykke, 2012), in which a national research infrastructure for radio and audio based research is built through a collaboration between universities and radio archives. This infrastructure they attempt to build will support knowledge dissemination, sharing and interaction between different kinds of humanities researchers. This is in line with the idea of exploring alternatives to traditional subject cataloging for visual works, by providing necessary scholarly-based links between texts and images (Winget, 2009).

One recent project of online collaboration for educational purposes is the “Media Ecology Project” (MEP) [(rw)], an online collaboratory lead by Columbia University that connects archives of historical media to researchers in film and media studies and related fields and disciplines. The platform also facilitates collaboration with students, who can write a formal analysis of films, embedding fragments to illustrate their arguments. Teachers can read these reports and provide feedback, and promote online discussions between groups of students. This project is innovating in finding ways not only to provide online access to primary moving image research materials but to engage researchers in new ways of scholarship and online publishing.

2.8.3. Domain experts’ conceptual models for visual analysis and annotation

Image analysis is performed not only by information professionals with the purpose of content representation but also (or mainly) by scholars as part of their interpretative work. Art historians have produced several models (Winget, 2009). Most literature about image indexing cites the Panofsky/Shatford matrix as the most influential model for describing image content (Westman, 2009, p. 64).

Panofsky’s (1939, 1977 ed.) “Studies in Iconology”, translated into English in 1955, has been one of the most influential works about the problem of “meaning” in the arts (Winget, 2009). He proposed three levels of meaning in artistic images: pre-iconographical, iconographical and iconological. The pre-iconographical level corresponds to the primary or natural meanings, related to factual knowledge of the viewer that is created from familiarity with objects and personal experience. The iconographical level refers to secondary or conventional meaning, to themes and concepts that emerge from “conventional” meaning that is

transmitted through literary sources. The iconological level is the most abstract and symbolic; Panofsky refers to it as “intrinsic meaning or content”, which is apprehensible through “synthetic intuition.”

Layne (1986) (also known as Shatford, or Shatford-Layne) adapted and extended Panofsky’s levels by adding four more facets (i.e., “who”, “what”, “where”, “when”), and the equivalent levels of “ofness” and “aboutness” for each of the first Panofsky’s levels (i.e., “pre-iconographic”, and “iconographic”). Layne indicates that at those two levels “of” words describe people, paces, objects, conditions, and actions that have a physical manifestation: at the “pre-iconographic” level, she explains, “of” is generic description of objects and events; while at the “iconographic” level, it is a specific, or proper, appellation of those objects and events. Layne continues explaining that “about” words include those describing emotions (love, sorrow) and concepts (truth, honor) (p.45). Layne’s extension of Panofsky’s model is shown in Figure 2.6.

Ranga-nathan	Bibliotheque Nationale	FACETS	Specific Of	Generic Of	About
Person-ality Matter	Anthropomorphic Zoologic Mineral Manufactured objects	WHO? animate and inanimate; concrete objects and beings	Individually named persons, animals, things ...	Kinds of persons, animals, things	Mythical beings (Generic/Specific) Abstractions manifested or symbolized by objects or beings
Energy	Actions, Themes	WHAT? are the objects and beings doing? (actions, events, emotions)	Individually named events	Actions, conditions	Emotions Abstractions manifested by by actions, events
Space	Place	WHERE? locale, site place; geographic cosmographic architectural	Individually named geographic location	Kind of place geographic or architectural	Places symbolized (Generic/Specific) Abstractions manifested by locale
Time	Time	WHEN? time; linear or cyclical	Linear time; dates or periods	Cyclical time; seasons time of day	Emotions or abstractions symbolized by or manifested by time

Non-facet-Specific Aboutness

Figure 2.6. “A faceted classification of the subject of pictures” (Layne, 1986).

Layne’s adaptation is commonly known as the “Panofsky/Shatford matrix,” which became a model frequently used for describing image content in the visual domain (Westman, 2009), used in the practice of subject cataloging for fixed images. There are some criticisms to this adoption, which are based on mainly two arguments: (1) interpreting an artwork and/or identifying its meaning should not be the task of cataloging, this is done as part of scholarship and requires time, effort, and subject expertise (Jespersen & Jespersen, 2004; Winget, 2009); and (2) Panofsky’s levels work well for specific forms of art (e.g., Renaissance paintings), but not for other aesthetic objects (Winget, 2009).

Even though, the Panofsky/Shatford matrix has proved to be useful in analyses related to moving images as well. Perhaps the first report about its used in this domain is Armitage and Enser (1997) who proposed the use of the Panofsky-Shatford matrix for the analysis of user queries to seven archives of still and moving image materials. Figure 2.7 shows their adaptation.

	Iconography (Specifics)	Pre-iconography (Generics)	Iconology (Abstracts)
Who?	individually named person, group, thing **(S1)**	kind of person or thing **(G1)**	mythical or fictitious being **(A1)**
What?	individually named event, action **(S2)**	kind of event, action, condition **(G2)**	emotion or abstraction **(A2)**
Where?	individually named geographical location **(S3)**	kind of place: geographical, architectural **(G3)**	place symbolised **(A3)**
When?	linear time: date or period **(S4)**	cyclical time: season, time of day **(G4)**	emotion, abstraction symbolised by time **(A4)**

Figure 2.7. The "Panofsky-Shatfort mode/facet matrix" used to the analysis of user needs in image archives (Armitage & Enser, 1997, p.290)

Besides the Panofsky/Shatford matrix, there are other models proposed for the analysis (and/or indexing) of visual content. Hollink, Schreiber, Wielinga, & Worring (2004) adapted, extended and applied some of their preceding models for creating a framework that was used for classifying visual resources related queries and annotations. The framework proposed by these authors is based on Jaimes and Chang (2000), Shatford (1986), Armitage and Enser (1997), Eakins (2002), and took into account the Dublin core metadata sndard and the VRA Core Categories.

The authors distinguish between the models that structure "images", and models that structure "descriptions of images." The resulting proposal, one of the most comprehensive ones, uses the Unified Modeling Language (UML) to visualize the framework. Figure 2.8 shows this representation. It distinguishes three viewpoints on images, including the "non-visual" metadata level, the "perceptual level", and the "conceptual level". The "conceptual level" corresponds to the previous Panofsky/Shatford matrix.

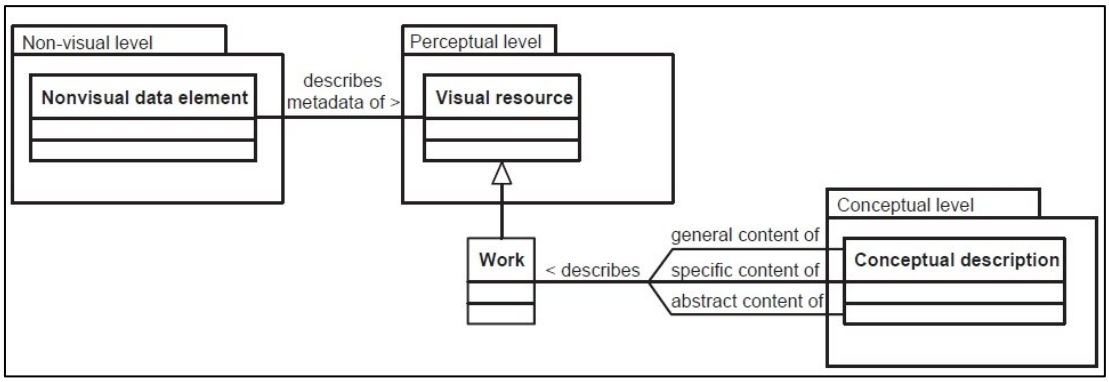

Figure 2.8. "UML package diagram of an integrated framework for the classification of image descriptions" (Hollink et al., 2004)

More recently, Tirilly et al. (2012) proposed a model of image description based on characteristics obtained from experimental data in a study of the features of image similarity. According to them, their model provides a basis to define the image features that image retrieval systems should implement (p. 170). The features in their model refer to the image properties (e.g., type/technique, focus, point of view, lighting, contrast, file quality), to the scene's semantic and physical properties (e.g., place, time, color, composition), and to the objects' semantic and physical properties (e.g., nature, emotion, color, texture).

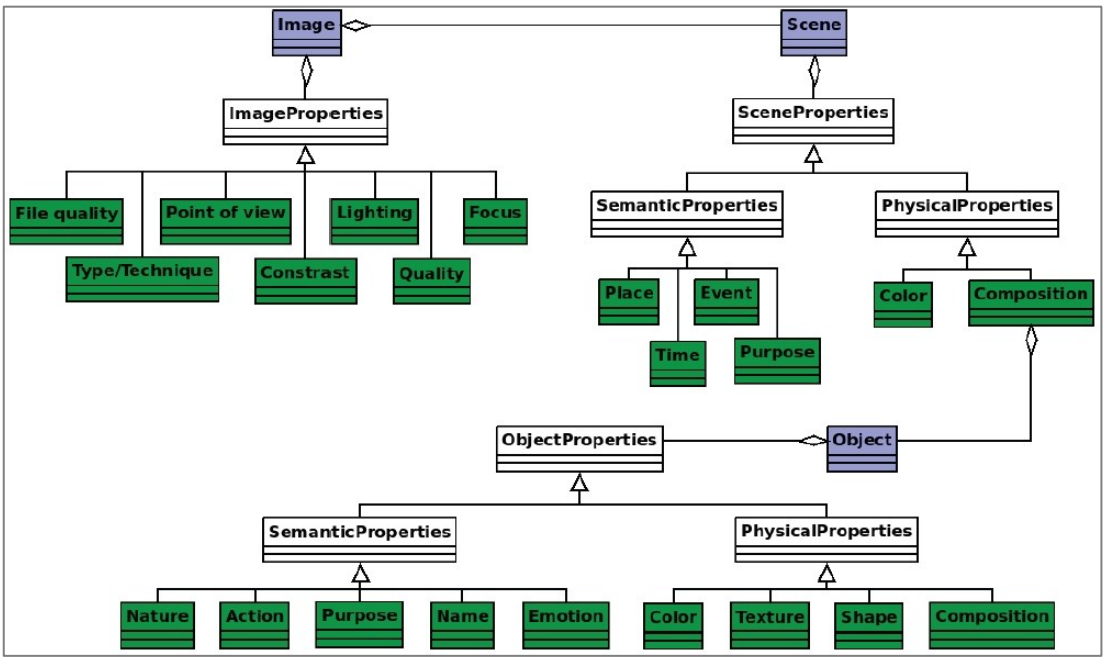

Figure 2.9. "Model of image description" (Tirilly et al., 2012)
(Feature levels: "image", "scene," "object"; other boxes in grey are "property features")

Even though the models mentioned above refer mainly to fixed image analysis, they have been used to analyze moving images as well. Hollink (2006) used her framework for classifying visual resources (Hollink, 2006; Hollink et al., 2004) in three different contexts, one of them being broadcast news for a content-based image retrieval system. The results

showed that the specific level was more important in the news domain than in the other domains (p. 121). In turn, Gligorov et al., (2011) used Hollink's and Panofsky/Shatford models in the analysis of *"Waisda?"* tags for television programs of a broad and entertaining nature.

In a study of key-frame extraction, Kim & Kim (2010) reviewed six representative models for fixed image analysis concluding that most models have in common the three Panofskian levels: the first level corresponds to the primitive features of an image (e.g., color and shape); the second level, relates to derived attributes such as the presence of specific objects; and the third level, includes semantic abstract attributes of the image, such as the symbolic value.

In general, there is a lack of research about how these models for fixe image analysis apply or adapt to moving image, and to the content attributes of time-based descriptions for film works. Few exceptions come from initiatives to identify sets of elements for descriptions to be used for future retrieval. They include these proposals:

- Rafferty and Hidderley (1997; 2005) propose different levels of meaning that apply to moving images, more specifically to fiction films*, with the intention to facilitate the indexing according to the film's narrative structure. The authors draw elements from semiotic models that are recognized in the film domain (i.e., Bordwell, Genette, and Gunning), and propose a "democratic" approach that allows combining the indexers descriptions with user defined descriptions. The elements in their model include: (1) Biographical aspects, (2) Events, (3) Object content (i.e., details of the different objects identified in the events or fragments), (4) Overall content, and (5) Interpretation (i.e., the overall mood).
- Hertzum (2003) did not propose a model for moving image description of classification, but analyzed a set of requests to a film archive, developing a bottom-up coding scheme that ended up with a categorization of the attributes needed by real users. They include: (1) Production-related attributes (e.g., "Title, production year, director, actors, film music, book on which film is based, production country, film company and type"), (2) content-related attributes (which concern the identifiable entities appearing in a film; these attributes include location, time, persons, events and objects); (3) subject ("aboutness") related attributes (e.g., theme, genre, author intentions, emotional experience); and (4) Screening-related attributes (e.g., cinema theater, TV channel, exhibition/festival, date or period where the film was shown, programmes and film listings of contemporary newspapers.")
- Kirkegaard (2008) investigated the attributes needed for constructing surrogate records for broadcasts in the Danish national collection of television broadcasts. His proposal derives from the investigation of information needs of media scholars and students. The final set of elements includes 24 access points divided into five categories: bibliographic, screening, content, archival, and relational.
- Geisler et al., (2010) and Geisler, Willard and Ovalle (2011) developed a metadata schema for time-based annotations based on their *crowdsoucing*-related study. The authors

propose four levels in their schema: the non-time based metadata elements (e.g., title, contributors, etc.); the time-based or content metadata elements (e.g., sequence, scene, shot); the user-defined metadata elements (i.e., sound, motif, song, commentary); and the controlled vocabularies that are used in the schema for the time-based annotations (i.e., set_type, time, shot_type).

The previous initiatives give an account of different proposals for sets of elements (i.e., attributes) intended for the description of moving image content, and were not necessarily constructed as moving image analysis models. However, they overlap, to a great extent, with models for visual or audiovisual analysis with a scholarly origin. This section has discussed how, to date, mostly the Panofsky/Shatford model is being used as a way to categorize moving image descriptions, and the criticisms that the model has received. However, the most important issue that requires consideration from the point of view of moving image content analysis is that the Panofsky/Shatford model was not intended to be applied to moving images. Because those include a temporal dimension and different levels (Figure 2.1) that do not overlap with visual materials, future work is needed to explore how the several proposals that apply to moving images could be integrated into a more suitable model that includes the temporal dimension and levels.

2.8.4. Motifs and themes

"Motifs" and "themes" are central scholarly concepts to the analysis of subject matter for fictional moving images. Together with the models described in the previous section, they are a relevant issue in the description of content annotation perspectives attempted in this chapter.

Literary critics have long discussed the difference between these two terms, and this discussion is at the core of a discipline called "thematology or thematics" (Seigneuret, 1988, p. xv), which originated in literature studies. Commonly, motifs are also called "tropes", "leitmotifs", or "narratives." In Seigneuret's view, a motif belongs to the theoretical level and is intellectual by nature, and refers to more abstract categories that involve teleological thinking. Meanwhile, he explains, "theme" seems to have a more practical and concrete scope. This example illustrates this distinction:

> "Cervantes' hero is unique (theme), while his message (motif) is familiar to readers of every continent. Such types are walking in our streets (motif), where, however, there are no windmills (theme)." (Seigneuret, 1988, p.xviii).

This distinction resembles the difference between the concepts of "ofness" and "aboutness" introduced at the beginning of the chapter (§2.2.1). For example, a subject descriptor for Don Quixote in a library catalog may be "Knights and knighthood", while a time-based tag of a film adaptation, may be "windmills."

During subject cataloging, it is usually the indexing expert who provides the motif's descriptions, while in research, explains Seigneuret, a motif emerges from readings during

scholarly work which requires interpretation. Following the same example presented above, scholars have intensively analyzed this literary work for decades, showing a rich variety of motifs and themes. Additionally, (library) subject descriptors intend to represent the document content as a whole, for the intended users of a library, while motifs or themes may be several for a single work. This example illustrates the "tension" between the domain and indexing experts, and the need for complementarity.

Because motifs and themes, as Seignoret claims, intend to be shared by a community of scholars, or even universal (1988, p.xviii), subject description should offer ways to link to those domain expert categorizations. Even more, due to the need to provide a framework for guided tagging for moving images (as discussed in §§2.6.2, 5.3.4), research about types of time-based tags should also be informed by these scholarly concepts.

2.9. Conclusion

To conclude this review about the different perspectives that provide solutions to the problems of moving image content annotation and access, it is necessary to remember that one of the main concepts or differentiating factors between *crowdsoucing* and *nichesourcing*, that can provide indications about which types of annotations can be obtained from participants (which is one of this thesis' main research problem), is that of "expertise".

Within the perspectives examined in this chapter, it is possible to observe the differences in the degrees of domain and indexing expertise in the groups of people performing annotation tasks in each perspective. This applies both to a person or group designing the annotation system or infrastructure, and to the person performing the final annotating activity. In this chapter, indexing expertise is mostly observed to be an attribute of (human) information professionals (§2.3) and of IR infrastructures (§2.4, §2.6). In parallel, domain expertise, referred to the knowledge of film and media, is mostly associated to the creators of the film and media works (§2.7), or to film and media scholars (§2.8). Determining the level of domain or indexing expertise in other approaches is more difficult. For instance, there may be domain experts (also in other domains different than film and media) who perform tagging activities (§2.5), or also provide input to computational processes (§2.6) as part of different tasks; in these cases they may not have indexing expertise, though it could also happen that they do.

Consequently, it is not possible to establish a clear connection between groups of people according to those expertise levels, and the types of annotation outputs that they create. However, in terms of academic "traditions" there is a more clearly established distinction. For instance, (1), catalog records and subject headings, which are usually created by indexing experts, who do not necessarily have domain expertise; (2), tags, which are created with low or medium level of indexing expertise and an unknown level of domain expertise; and (3), annotations (personal, as in note-taking or "glossing[37]" acts), which are created with an

[37] To avoid confusion with the term "annotation" that is proposed in Section 3.4.1, from this section on, the term the

unknown level of indexing expertise, and high domain knowledge. Figure 2.10 shows the broad correspondences of these concepts.

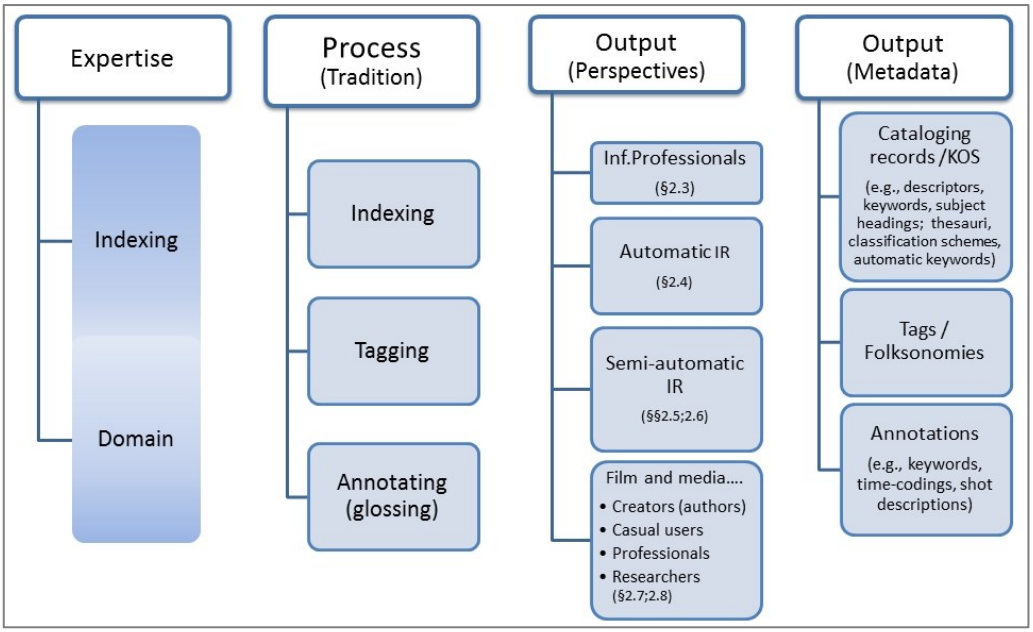

Figure 2.10. Different forms of annotating information in relation to domain and indexing expertise.

Among the three different traditions identified in Figure 2.10, there are several standardization efforts that are being made to provide broader frameworks in order to enable interoperability between the cataloging and metadata standards in each tradition. The groups who create the standards for different types of annotations, i.e., the professional associations or standardization bodies, are another side of the information professionals' annotating perspective (§2.3).

Currently, most of the standard designers attempt to adapt existing metadata standards to web standards promoted by the W3C consortium. For example, the "EBUCore 1.5" metadata standard, adapts to the Semantic Web principles, and makes the standard available as an RDF ontology compatible with the W3C "Media Annotation Working Group" ontology, which model is common and based on the "EBU class conceptual data model" (EBU Technical, 2014).

Within the "cataloging" or "indexing" tradition shown above, and described before (§2.3.2.1), the most important unifying conceptual model is the FRBR family of conceptual models (i.e., FRSAD, FRAD, $FRBR_{ER}$). An effort in integrating these frameworks into a broader model that is also compatible with the broadest framework in the cultural heritage sector (i.e., CIDOC CRM) is FRBRoo. A recent publication by the international working group on FRRB and CIDOC CRM harmonization presents a comprehensive view of FRBR and a model in the form of a formal ontology (International Working Group on FRBR and CIDOC CRM Harmonisation, 2015). The

word "glossing," or "scholarly" added to this type of annotations to emphasize the distinction.

objective of this initiative is to "capture[] and represent[] the underlying semantics of bibliographic information and therefore facilitate[] the integration, mediation, and interchange of bibliographic and museum information" (p.10). This effort is (explicitly) compatible with the formalism proposed by the W3C for representing ontologies in RDF. Together, this broad conceptual framework (FRBRoo), data model (RDF), and the initiative of harmonizing Linking Open Vocabularies (LOV) in the context of Linked Open Data (LOD) constitute the current effort for guaranteeing interoperability between the metadata created by information professionals (i.e., cataloging and metadata). However, at this time, there is no mapping yet of the FRBRoo to other standards or frameworks from the archival domain, such as EAD, or from the media content perspective (MPEG-7), which are of importance for moving image annotation and archival collection descriptions. But an initiative to map EAD to the Europeana Data Model (EDM), is presented by Hennicke et al., (2011).

The "tagging" tradition also pursues standardization efforts. The most current encompassing ontology in this domain is Modular Unified Tagging Ontology (MUTO), which departed from available tagging ontologies and constructed a unified vocabulary combining those ontologies in one consistent schema (Lohmann, Díaz, & Aedo, 2011). The previous indexing expert communities investigate the standards and frameworks to be applied in the domain of non-information professionals' annotations.

Likewise, parallel efforts for standardization of "personal" or scholarly annotations (glossing) are carried out by the W3C Open Annotation Community Group, which attempts to merge two initiatives that emerged in 2010 (the Annotation Ontology) and in 2011 (the Open Annotation Model). This initiative, as explained by Sanderson, Ciccarese and Van de Sompel (2013a), introduces the "Open Annotation Data Model", which provides a model for exchanging annotations between systems by means of RDF graphs. They also comprehensively review previous modeling initiatives and annotating "tools". A previous important effort in this field was the "LEMO Annotation Framework" (Haslhofer et al., 2009), which presented a unifying view of annotation (§3.4.1). This effort already showed the need for creating a standard-based annotation model that covered different content types and supported annotation sharing in online environments. In the LEMO annotating frameworks, annotations are linkable, open and interoperable, extensible (supporting different ways of annotating), and multimedia-enabled (supporting uniform fragment creation and identification of all types of resources). Fragment identification is the main concern related to multimedia annotations, but also to other types of sources (e.g., paragraphs in documents).

Added to these traditions, the models for image analysis originating in the scholarly domain also provide perspectives for content annotations at the semantic level, of which the Panofsky/ Shatford model (1986) is widely used, but not adapted yet to moving image analysis, although important alternative models are proposed (§2.8.3). In addition, current work on modeling provenance information, which is essential for enabling user participation by tracking cognitive origins, seems to be integrated into the Open Annotation Data Model, but only partially or not taken into account in the other models.

In sum, the world of media annotation standards seems to be fragmented and not ready for enabling the integration of user-generated annotations. However, broader conceptualizations of the concept of annotation may be evolving into a more integrated view (this will be the topic of §3.4.1). In the next chapter, the three main annotating traditions depicted in Figure 2.10 will be used to guide the examination of the theoretical frameworks that could be applied to study of these traditions from a behavioral perspective.

CHAPTER 3. Theoretical Framework: (Human) Information-Annotating Behavior in an Interactive Seeking & Retrieval Framework

"Both the imagination and understanding require models" (Svenonius, 1985).

3.1. Chapter overview

This chapter attempts to find theoretical foundations for the study of the three different traditions of moving image annotation identified in the previous chapter (i.e., indexing, tagging, and annotating (glossing)). This chapter introduces a framework that can encompass those perspectives using a theoretical angle and simultaneously serve as a guide for this thesis' research design.

First, Section 3.2 introduces the main principles and concepts from the disciplines in which this thesis work is framed: "Library and information science" (LIS), and especially "Human Information Behavior" (HIB, or simply, IB). This section concludes that there seems to be a gap in the definition of IB areas of study, which do not represent behaviors of information interaction during processes of information creation or input in the form of annotations, such as those described in Chapter 2.

Consequently, Section 3.3 intends to find more evidence of whether this gap is only in the definition of IB areas of study, or also in the models that guide IB research. This is done by presenting an analysis of the most important existing IB theoretical models. This analysis of the different models focuses on identifying whether indexing, tagging, or glossing are included in those theoretical constructs. This analysis identifies a lack of specific (micro-models) for those activities and a scarce explanation of their role in existing models that include information use. As a result of this analysis, a macro-model is selected (i.e., Ingwersen's & Järvelin's (2005) "Information Seeking and Retrieval Framework" (IS&R)), which makes it possible to explain the annotating activities comprehensively.

Subsequently, Section 3.4 and 3.5, attempt to adapt this framework for the study of the mentioned activities in two ways: by proposing the encompassing concept of "information-annotating behavior", which facilitates grouping the different perspectives of moving image annotation found in Chapter 2, and by identifying the main elements and definitions relevant to the study of information annotating-related activities. Based on this evidence gathered from previous research, an extension of the IS&R framework is suggested (§3.5). Hence, Section 3.6 describes how the proposed theoretical framework is used as a guide for this thesis research design, and describes the limitations and criticisms to the selected model.

Finally, Section 3.7 concludes the chapter by presenting a proposal for including information-annotating behavior studies as part of the IB areas.

3.2. Information behavior (IB)

This thesis work is framed within the principles and concepts of the LIS discipline. As suggested before (§1.2), there have been traditionally two approaches to investigate a research problem within this discipline, "human information behavior" (HIB, or simply IB), and "information retrieval" (IR). This chapter introduces the selected approach, the field of IB studies, in order to attempt making explicit this thesis' fundamental assumptions.

3.2.1. Concept of information

The object of study of the LIS discipline is still under debate (Ingwersen, 1992, p. 3; Estabrook, 2009, p. 3291), but a common ground seems to be found in defining its object as the effective communication of information and information objects in a given context (Saracevic, 2009). Throughout the history of the discipline, there have been different focuses for the study of the information communication process. Tuominen, Talja, and Savolainen (2002) identify three perspectives in the history of LIS: (1) the "information transfer" model, or the physical view; (2) the "constructivist" model, or the cognitive view; and (3) the "social constructionist" model, or social view.

Even though the information transfer model has been surpassed or complemented by the constructivist and social constructionist models, the first one is still commonly viewed as the focus of this discipline, and terminology and assumptions related to information "transfer" are common. Within the information transfer model, information objects or documents are transmitted through information systems in a cycle that covers activities such as the creation, instantiation, communication, acquisition, organization, management, regulation, preservation, distribution, and use of information (Estabrook, 2009). This cycle occurs within the process of scientific communication (Ingwersen, 1992, p. 1), scholarly communication (e.g., as researched in Fry & Talja, 2007) and/or, in everyday life situations (Savolainen, 1995, as cited in Fisher, Erdelez, & McKechnie, 2005).

The concept of "transfer" is problematic, though, since it is grounded on perceptions of documents as physical entities, recorded knowledge, or "information as thing" (Buckland, 1991) [38], which have been challenged by today's digital age. Indeed, until about 2005 the situation was as Belkin described it, in which the fundamental problem of information science was the effective communication of desired information between "human generator" and "human user" (Belkin, 1977, p. 22, as cited in Fisher et al., 2005; Ingwersen, 1992, p. 13). However, current practices and theories in social media[39] suggest that this distinction between generators and users implied in the concept of "transfer" has become blurred. In this transformed information communication cycle, the so-called users are also creators of new information that coexist in the same online environments, together with more formally

[38] A critical, political, and historical review of the concept of "information" is presented by Day (2001).

[39] Representative works on these topics include Clay Shirky in "Here Comes Everybody: The Power of Organizing Without Organizations (Shirky, 2008); or by David Weibenger in "Everything is Miscellaneous" (Weinberger, 2008).

generated ones. For this reason, this has been called the age of the "prosumers" (or "proactive consumers" as Alvin Toffler named them in 1981), today understood as content creators. These emergent dynamics have challenged the cyclical information transfer view[40].

Also, these dynamics have brought new challenges to defining the already unsettled concept of information, which is central to LIS. Indeed, defining information is highly problematic (Bates, 2009a), and depends on different theoretical perspectives (Hjørland, 1997, p. 110). From a cognitive, constructivist and interaction perspective, which is assumed in this thesis, instead of transfer, processes of knowledge construction and cognitive activity occur. Rather than "transfer" the focus is on the interaction that different actors have with information and information systems, assuming that the actors have cognitive differences from which they contribute to the information interaction process (Ingwersen & Järvelin, 2005).

From this perspective, information is seen "as a result of interpretation processes and vital in relation to human cognition" (Ingwersen & Järvelin, 2005, p. 193). In this cognitive view, "information is always information for *somebody"* and is situational also, which means that the same object represents different types of information for different domains of knowledge (Hjørland, 1997, p. 111-112).

In this described perspective, LIS is viewed as one of the disciplines dealing with human cognition and cognitive activities (Ingwersen, 1992, p.15). This leads to assuming a broad perspective on information acquisition, which happens not only through formal, recorded channels or IR systems[41], but also through people and different forms of visual information and environments that are part of broader contexts of information and communication interactions (Bates, 2009a).

3.2.2. History of IB research

Even though humans always have related to information, the formal study of this relationship is linked to the origin of IB as a discipline. Although some authors cite reports of IB studies done as early as 1916 (Wildemuth & Case, 2010), most seem to attribute the origin of this discipline sometime in the 1950s and 1960s, when the so-called new communication technologies emerged and called for novel conceptualizations.

From 1959 to 1979 IB studies were known as "user studies", or "studies of information seeking and gathering", or studies of "information needs and uses" (Menzel, 1996, as cited in

[40] This thesis focuses on different information-annotating processes for moving images, mostly on emergent ways of "organizing" information. It does not offer critical views on the broader social implications derived from these ways of "manufacturing participation" (using the title of Prof. Eggo Müller during his conference at Utrecht University, February, 2014). Critical views on this phenomena are presented, for instance, by Day (2014b): "From a digital class of unpaid workers, especially of content creators (often called "prosumers"), Internet companies derive profit by selling access to that content and by sometimes repack-aging that content and data mining it. Content creators' knowledge and work seem to constitute an endless source of raw material, and these workers seem to constitute an endless source of unpaid labor." (p.36).

[41] In this thesis the term information system*, information processing system*, and information retrieval system (IR system)* are used differently.

Bates, 2009b). As Wilson explains, “the focus was almost entirely upon how and for what purpose library and information systems were used” (Wilson, 2010). However, gradually, the term “information-seeking research” was used to include all kinds of investigations on people’s interaction with information.

One key study representing a shift towards people is Wilson and Streatfield (1977, as cited in Ingwersen & Järvelin, 2005). More recently, however, some researchers came to feel that information seeking suggested only explicit efforts to locate information and did not include the many other ways people and information interacted. In the 1990s, the term “information behavior” (IB) came into wide use to replace “information seeking” (Bates, 2009b).

According to Bates (2009b), IB is also a sub-discipline within LIS. However, it is more common in LIS research to see IB studies as “user studies,” even though there is a fundamental distinction between the two notwithstanding their aforementioned common historical roots. In user studies the focus relies on the behavior of a person in relation to an particular system (in her/his role of “user”), while in IB studies, the center is on “the particular relationship between [such] human users and information itself”, on human behavior as it relates to information (Burnett & Erdelez, 2010).

The term IB thus appeared only as late as the mid- and late 1990s (Pettigrew, Fidel, & Bruce, 2001, pp. 44-45, as cited by Fisher et al., 2005, p.xix). This coincides with the breakthrough of the Internet (the web), and the generalized use of personal computers, which called for a broader spectrum of understanding information ‘behavior’ rather than simply ‘seeking’ or ‘searching’ (P. Ingwersen, personal communication, January 2015).

As Wildemuth and Case (2010) explain, in that decade an important group was founded, the “ASIS&T’s Special Interest Group/Information Needs, Seeking and Use” (SIG/USE), and also the “Information Behavior Conference” (ISIC) began, together with the appearance of an online journal with a focus on IB “Information Research.” These were all “indicators that IB research was coalescing as a subfield of information science” (p.37).

On a parallel side, IR studies also had historically been evolving, from a center on technology, systems and documents, to the users and their interactions: “Over time the conceptions move towards the user, the information seeker’s work situation, and knowledge state and towards a social and cultural context” (Ingwersen & Järvelin, 2005). To date, these two streams of information studies converge and are enriched by complementary areas such as human-computer interaction (HCI).

3.2.3. The concept and types of IB

While many IB studies are focused on information seeking, Wilson’s (1999, p. 249) commonly accepted definition of IB studies has a more comprehensive view: "the totality of human behavior in relation to sources and channels of information, including both active and passive information seeking and information use."

Fisher et al. (2005) define information behavior as the "totality of human behavior in relation to sources and channels of information". They state: "we conceptualize information behavior as including how people need, seek, manage, give, and use information in different contexts" (p.xix). Burnett and Erdelez (2010) also indicate the different ways in which people interact with information: seeking, browsing, encountering, using, exchanging, avoiding, etc., adding to them the purposes of these interactions, i.e., to complete tasks, to resolve needs, to give assistance to others, or to keep themselves entertained (p.48).

Even though these definitions try to encompass most aspects of IB, traditionally IB research has concentrated on information-seeking and information-search studies. This is demonstrated in Wilson's (1999) nested model of the information seeking and information searching (Figure 3.1).

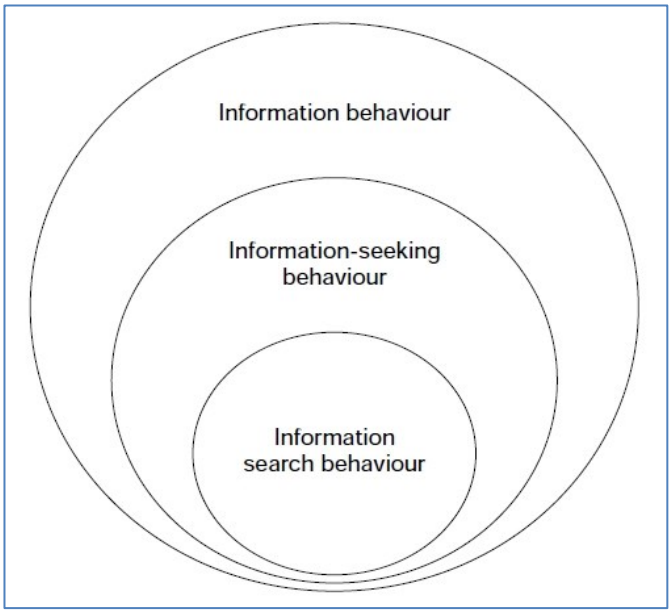

Figure 3.1. "A nested model of the information seeking and information searching research areas" (Wilson, 1999)

In a later model (Wilson, 1996, as described in Wilson, 1999), its author more explicitly includes "information-use behavior" as one of the subcategories of IB. This issue will be addressed later in this chapter (§3.7).

Finally, one important concept to clarify in relation to defining IB is that of "behavior." Both this concept and the concept of "cognitive view point" in IR (§3.3.3) are problematic from an epistemological perspective. It is not in the scope of this thesis to investigate the foundations and implications of these terms (more details are found for instance in Fidel, 2012; Ingwersen, 1992; Wilson, 1994). A basic assumption in this thesis is that the concept of "behavior", as used in IB studies, refers to the responses or observable actions or outputs of an information processing related activity, as performed by a person in his/her interaction with other people or with information systems. The cognitive mental operations of categorization are inherent to these activities, thus also deserving to be investigated from an

information research perspective.

Because this thesis chapter attempts to find theoretical foundations for the study of the kinds of processes that take place during annotating moving images (e.g., as in the perspectives identified in Chapter 2), the next section explores how those activities are included as part of conceptual IB research.

3.3. Information-annotating behavior as one type of IB

This section explores how the IB discipline has conceptualized the information activities that take place during moving image annotation. According to the perspectives identified in Chapter 2. For this purpose, this section examines the major IB models in order to observe whether those behaviors have been included explicitly in these theoretical constructs. This makes necessary the proposal of an encompassing concept of annotation, which is presented next.

3.3.1. The concept of model in IB research

The central conceptual constructs to IB are known as IB models, which originate from different disciplines and backgrounds (Fisher, 2005). A model is defined as a representation of a segment of reality which proposes a tentative set of relationships that help in the development of theory (Fidel, 2012; Fisher et al., 2005; Ingwersen & Järvelin, 2005). According to Ingwersen & Järvelin (2005) different authors have given different names, such as: conceptual frameworks (Engelbart 1962), metatheories (Dervin 1999; Tuominen 2001; Talja, Keso and Pietikäinen 1999), epistemological approaches (Hjørland and Nielsen 2001), paradigms (Kuhn 1970), or just models (Wilson 1999). They can take the shape of, for instance, conceptual models, flow chart models, and the like. As Ingwersen and Järvelin (2005) state: “all research has an underlying model of the phenomena it investigates, be it tacitly assumed or explicit” (p.11).

Models for the study of IB started to appear in the 80’s (Wilson, 2010) and have proliferated since then. Fisher (2005), for instance, identified 72 conceptual constructs (metatheories, theories, and models) coming from different disciplines (computer science, the humanities, the social sciences and LIS), and most were developed in the last three decades (Fidel, 2012, p.283).

These models have been classified in different ways. Ingwersen and Järvelin (2005b) grouped them into “broad/narrow”, “process/static”, “abstract/concrete”, “summary/analytical, general/specific.” Fidel (2012) classified them in a different way, as she explains: “action models” (which represent activities during information seeking and, at times, even before and after); “element models” (which represent elements that shape information seeking or, to translate into positivistic language: models that represent the variables affecting information seeking), and “mixed models” (which include both; some side by side, others in

an integrated fashion) (p.64). Likewise, Wilson (1999) observes that not all IB models are of the same type, since some intend to provide a framework for exploring the totality of IB, while others focus on the "active search" part of it, i.e., they are "information search" models which, as Wilson explains, "might be understood by the information retrieval researcher" (p.257).

Wilson (1999) defines a model as a "framework for thinking about a problem [which] may evolve into a statement of the relationships among theoretical propositions." As observed above, the level of abstraction varies in the different models. Some of them can be properly named "frameworks", or "macro-models", in the sense that they represent "the gross information-seeking behavior" (Wilson, 1999, p.252).

3.3.2. Analysis of IB models

This section presents an analysis of existing IB models, aiming to identify whether IB theory has conceptualized information behaviors in which people interact with information through creating annotations. This review is necessary because IB tries to understand human behavior in relation to information, thus requiring a highly theoretical component.

The list of models analyzed in this section was gathered through a review of the most comprehensive IB sources: (1) Fisher et al. (2005), (2) Case (2012), (3) Fidel (2012), (4) Wilson (1999), and (5) Xie (2008). A total of 80 models were described in those sources and were analyzed following these criteria:

- **(a)** Whether they explicitly include any information annotating-related activity (e.g., indexing, tagging, note-taking) in the model; and/or
- **(b)** Whether they include "information use" as part of the models, in addition to seeking and retrieving information, in a way that implicitly suggests that any type of analysis and/or annotation activity may take place as part of the information seeker's behavior.

The analysis found that there is no explicit mention of indexing or tagging behavior within the IB models reviewed. However, some models *somehow* suggest annotating-related activities, by considering specific stages during information-seeking that could involve annotation; or by referring explicitly to a specific type of annotating activity (i.e., note-taking). The models that fulfilled the aforementioned criteria are summarized in Table 3.1 and briefly described after.

Table 3.1. Summary of main information behavior models that deal with information annotation or information use in an explicit way

Category	IB model	Source[42]	Type of model	Criterium (a) (annotating is explicit)	Criterium (b) (annotating is implicit)	Annotating-related activities or relevant concepts for the study of annotating-related behaviors
A	Big six model by Michael Eisenberg and Robert Berkowitz's (1990)	(1); (3)	Action model (3)	No	Yes	Use of information (engage and extract) as one of the information literacy skills
	Ellis's Model of Information-Seeking Behavior (2005)	(1); (3)	Action model (3)	No	Yes	Extracting and monitoring information as two of the six activities of seeking behavior
	Kuhlthau's Information Search Process (1991)	(1); (2); (3)	Action model (3)	No	Yes	Extracting information is one information-seeking phase, it includes "taking notes" as part of this phase
B	Dagobert Soergel's model for the acquisition and use of information (1985)	(3)	Action model (3)	No	No	Concept of "request-oriented indexing (problem-oriented)" vs. "entity-oriented" indexing.
	Wilson's second model of information behavior (1996)	(1); (2); (3)	Mixed model (3)	No	Yes	Explicit concept of "information-use behavior", which includes 'annotating' (glossing) activities

[42] The four sources used for reviewing the IB models are coded with these numbers: (1) Fisher (2005); (2) Case (2012); (3) Fidel (2012); (4) Wilson (1999), and (5) Xie (2008).

Category	IB model	Source[43]	Type of model	Criterium (a) (annotating is explicit)	Criterium (b) (annotating is implicit)	Annotating-related activities or relevant concepts for the study of annotating-related behaviors
C	Catherine Sheldrick Ross's Reader Response Theory (1999)	(1); (2)	Theory (2)	No	Yes	Concept of "active reading", incorporation of reading theory into LIS and IB studies. Relevant for the study of 'annotating' (glossing) behavior.
	Harry Bruce's "PAIN Hypothesis" (2005)	(1); (3)	Concept (3)	No	Yes	Concept of "personal anticipated information need", "personal information management", and "personal information collections."
	James Krikelas's Model of Information Seeking (1983)	(1); (2);(3)	Action model (3)	No	Yes	Concept of "Information gathering", "information giving" in relation to "messages dissemination", "personal files"; "categorization of sources."
	Kevin Rioux's Information Acquiring-and-Sharing (2000)	(1)	[Concept]	No	No	Conceptualization of "sharing" and "non-sharing" behaviors in web-based environments.
	Ross Todd's Information Intents	(1)	[Concept]	No	Yes	Conceptualization of "information intent" as the active and creative role of a person during information use.
D	Integrative Framework for Information Seeking and Interactive Information Retrieval	(1); (3); (5)	Element model (3); macro-model (5)	No	Yes	The model is hospitable to different information behaviors; the concept of "interaction" in context is suitable to explain information-annotating related behaviors.

[43] The four sources used for reviewing the IB models are coded with these numbers: (1) Fisher (2005); (2) Case (2012); (3) Fidel (2012); (4) Wilson (1999), and (5) Xie (2008).

–***Category A*.** As it can be observed in Table 3.1, three of the most important "action models," as conceptualized by Fidel (2012), are the most suitable to include annotating-related activities and/or user input as part or continuation of the information-seeking activities:

> "Action models represent activities during information seeking in a variety of styles. Some represent the search process with ordered successive activities, others are two-dimensional diagrams that add a representation of the relations between the activities, and yet others list activities in no specific order" (p.65).

Eisenberg and Berkowitz's (1990) **Big Six model** includes two relevant skills as part of their six phases: fourth, "use of information"; and fifth, "synthesis." This model is widely used in information literacy education. The fourth skill describes, in turn, two steps: "engage (read, view, etc.)" and "extract information." The last sub-step certainly could be related to information-annotating activities. The authors of this model actually offer support material for training students and teachers in the note taking abilities in their website "BigSix (notetaking)[(rw)]. Likewise, the fifth skill, "synthesis", suggests the use of databases and note cards to organize information. Even though their model proposes annotating-related activities, as in the case of Ellis's model (described next), there is no explicit explanation in their model about how people engage and extract relevant information while reading, hearing, or viewing, and/or whether the extracted information goes back somehow back into an information system.

Likewise, **Ellis's Model of Information-Seeking Behavior** (Ellis, 2005), "extracting" is the last of a series of six activities that he identified as patterns of information-seeking behavior: starting, chaining, browsing, differentiating, monitoring (and extracting). "Extracting," as defined by Ellis, "refers to the activity of going through a particular source selectively identifying relevant material from that source" (Ellis, 1989, p. 198). It means the same as obtaining information from an information source. This activity is identified as one common behavior by researchers, for instance, when they are giving presentations or writing reports (Ellis, 1997). The model, though, does not explicitly include annotating-related activities that could eventually take place as a sub-activity of information extraction. However, from Ellis (1989) descriptions of the "extracting" and "monitoring" activities, it could be deduced that a person may be active in annotating or in using existing annotations while pre-selecting sources, or "working through individual runs of journals, sets of publishers' lists, bibliographies, indexes or abstracts, or by consulting cumulative indexes to such sources" (p.198).

More explicitly, **Carol Kulhthau's Information Search Process model** (Kuhlthau, 1991), which proposes six stages (i.e., initiation, selection, exploration, formulation, collection, and presentation) describes a fifth stage, named "collection", in which a person may make detailed notes since there is a clearer sense of direction during the task of gathering information. As in the case of the other previous two models, there is no clear description of how this process occurs either.

–***Category B***. Most IB models are centered on information seeking and searching (as it was emphasized in §3.2.3). However, two of the reviewed models explicitly focus on "information use" in a way that suggests that a person may take an active role by performing annotating-related activities during searching or seeking[44]. One of them is **Dagobert Soergel's model for the acquisition and use of information** (Soergel, 1985). He developed this model in the context of decision-making and problem-solving, which he considered to be the goal of information seeking and use (Fidel, 2012). Although he does not refer to information annotating-related activities, his model could add value for explaining information annotating-related behaviors, since he proposes a view of information use as a process of creating new messages based on the original sources that a person reads or listens to (Soergel, 1985, pp. 14–16). Also, Soergel proposes that actors use information retrieved to continue the search (Fidel, 2012, p.66-67), which reflects a dynamic change in the individual cognition, but as well in the information system caused by user input.

The other IB model which explicitly includes information use is **Wilson's general model of information-seeking behavior** (Wilson, 1999). This model includes "information processing and use" as part of the "feedback loop", as it is observed in Figure 3.2.

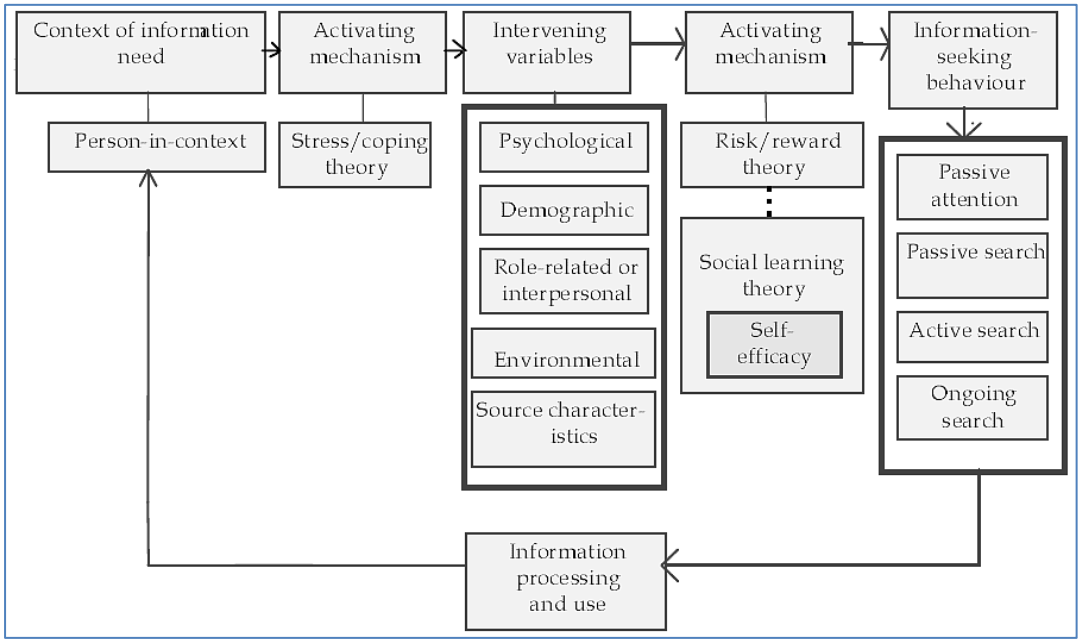

Figure 3.2. Wilson's (1996) model of information behavior (as cited in Wilson, 1999)

Information-use behavior is defined by Wilson (2000) as "the physical and mental acts involved in incorporating the found information into the person's existing knowledge base", which implies activities such as marking texts (Wilson, 2000, p.50) (see also §3.7). This

[44] There are other IB models in the reviewed sources which focus on information use. However, they do so in very specific or contrarily too abstract levels, which do not allow perceiving whether the models include annotating-related activities in their scope. These include, for example, the "Everyday Life Information Seeking" model by Reijo Savolainen; "Information Grounds", by Karen E. Fisher; "Information Interchange", by Rita Marcella & Graeme Baxter; and "Organizational Sense Making and Information Use", by Anu MacIntosh-Murray.

definition indicates that some types of annotating activities take place during information seeking, which can be classified under scholarly annotating (glossing) behavior.

–***Category C***. Other IB models found in the reviewed literature suggest concepts that could be eventually considered as dimensions of the study of how people annotate information. These models, summarized in Table 3.1, include the following:

- Catherine Sheldrick Ross' "Reader Response Theory" introduces reading theories to the study of IB, emphasizing the relationship between texts and readers; as well as Ross J. Todd's "Information Intents," who also proposes the active and creative role of a person during information use.
- James Krikelas's "Model of Information Seeking", and Harry Bruce's concept of "information giving" in his "Personal Anticipated Information Need" ("PAIN Hypothesis") bring to attention the factors involved in the personal use of information.
- In turn, Kevin Rioux "Information Acquiring-and-Sharing", introduces the dimension of information sharing in online systems.

–***Category D***. In the reviewed sources, there is another group of IB models, called, "macro-models" (Xie, 2008), which were also evaluated. Xie (2008) identifies three major macro-level models, from an Interactive Information Retrieval (IIR) perspective: Belkin's (1996) "episode model of interaction with text"; Saracevic's (1997) "stratified model"; and Ingwersen & Järvelin's (2005) "integrated IS&R research framework."

However, following Wilson (1999), the models proposed by Belkin and Saracevic were not considered as suitable models for the study of information annotating-related behaviors, since they are mostly focused on information searching and the design of IR systems. Indeed, Belkin's model seems to be focused on representing users' interaction with the IR system during search (Xie, 2008). Likewise, Saracevic's model presents different interaction levels with an IR system. However, these interactions are restricted in his model to searching and relevance judgments, not including information-use activities as part of the factors. In spite of this focus, Saracevic's model is developed within a framework of information use (Wilson, 1999). In sum, these two models are potentially useful to explain annotating activities that occur especially during searching[45]. However, since the purpose of this chapter is to find a suitable model to explain a broad view on annotation as part of information-use behavior, these models mentioned above could not be considered. In turn, Ingwersen and Järvelin's (2005) "Integrative Framework for Information Seeking and Interactive Information Retrieval" (IS&R) seems suitable for the purposes stated above. It will be explained in the next section.

Besides the previous models, other disciplines than IB, for instance, HCI, have also looked into

[45] A more detailed explanation of the difference between seeking and searching is presented in Chapter 7 (§7.3.2).

annotating behaviors, with the purpose of finding insights for the development of information systems that support annotation. In Section 3.4.2.3 some of those projects were mentioned. A representative example is Oard, Kim, Aversa, & Manley, (2001), which is an attempt to derive a framework in which annotations become a central component in relation to other elements of information-seeking and retrieval processes. Even though this framework is interesting since it was built from a bottom-up perspective based on empirical research on observable behaviors, it lacks connection to equivalent efforts from the IB studies.

Finally, there is one model that has become intensively cited in the social tagging research community. Figure 3.3 depicts what has been known as a "model" of the tagging process. Smith (2007), also acknowledges that this is "a fairly simple model" of tagging, "where users apply tags to resources such as photos or web pages within a system."

Figure 3.3. Common 'model' of tagging process (Smith, 2007)

The previous model seems to be a quite reductionist and isolated conceptualization, lacking theoretical enrichment from complete formulations in the IB discipline.

It is possible to conclude after this examination of the major IB models that the processes of information creation or input in the form of annotations by the information seeker while using information seem to have been overlooked by the major IB models. Indeed, information-annotating related behaviors have not yet been included explicitly or in detail in those theoretical constructs, and that there are no specific micro-models associated to information-use related activities. Besides, most existing models that do suggest information use or any form of annotating activity do not seem to be adaptable or extendable to include this behavior without having to alter them significantly. On the contrary, one of the existing macro-models, the IS&R framework by Ingwersen & Järvelin (2005) seems to provide a comprehensive theoretical support for a holistic approach to the information-annotating phenomenon.

Because of these reasons, this framework is adopted for this thesis' research. Additional important factors that make it a hospitable model for information-annotating behavior study

can be summarized in that:

(1) It is a macro-model (Xie, 2008), which covers a wider range of information behavior elements and situations, not only seeking or searching, as it is also acknowledged by its authors:

> "[it] is also intended to cover the cases of *information behavior* that are not information seeking, where the latter is seen as nested within the former. Such activities are, for instance, the use, creation, communication and selection of information objects or human indexing of such objects. By focusing on particular components of the framework, and their immediate relationships and interactivity, the framework demonstrates its strength as modeling tool – also in such behavioral instances" (Ingwersen & Järvelin, 2005, p.306).

(2) It is founded on the holistic cognitive viewpoint, which corresponds to this thesis' assumption of annotating as a cognitive activity (§3.4.1).

(3) One of the central concepts of the cognitive theory for IIR, and thus for IS&R model, is the principle of polyrepresentation (§3.5.1), which favors the view of different interpretations of documents, certainly connected to the variety of annotation perspectives identified in Chapter 2.

(4) The framework offers a comprehensive and strong theoretical basis for the study of information seeking and retrieval in a comprehensive way, in addition to having the potential of serving as guidance for research, one of the purposes it was designed for.

3.3.3. The IS&R framework and the polyrepresentation principle

The Integrated Seeking and Retrieval Framework (IS&R) is an integrated conceptual model of IB and IR, which provides the definitions and methodological basis for formulating hypotheses and theories (pp. 12; 309) based on relationships between the elements in the model. It is also a macro-model, actually the most comprehensive model of information seeking and retrieval from the cognitive view (according to Xie, 2008, p.187), and the most comprehensive model of IIR. The IS&R framework extends Ingwersen's cognitive model of IR interaction, Belkin's episode model of interaction with text, and Saracevic's stratified model (Xie, 2008).

It is presented by its authors as a solution for the need of an abstract, analytical, general process model for IS&R which covers the whole scope from work tasks through information seeking to information retrieval (p.16). This model developed over the years from initial work by Ingwersen (1992), as a reaction to the laboratory model of IR evaluation, which originated in the Cranfield II project (Cleverdon 1967, as cited in Ingwersen & Järvelin, 2005, p.1). Ingwersen and Järvelin's indicate the purpose of their model as follows:

> "Our proposal is based on understanding the situational nature of information and on assuming persons' work tasks or cultural interests, and information needs based on them, as the basis for IS&R" (Ingwersen & Järvelin, 2005, p.2).

The model thus calls for incorporating "persons and their

> interpretations/perceptions, work tasks, interaction, situations and contexts" into information retrieval evaluations" (Ingwersen & Järvelin, 2005, p.9).

The integrated IS&R framework (Figure 3.4) consists of five components (in circles or semi-circle) named: "Cognitive actor", "information objects" (sometimes referred to as "document space"), "IT" or IR system, "Interface"; and "Context." The term "information space" is used by its authors as a way to encompass the "information objects" component as it is influenced or structured according to the IT component (information systems). The model also includes eight processes of interaction and/or cognitive transformations (represented with the numbers and arrows) that are executed during IS&R in context over time. Arrows (1) to (4) illustrate processes of interaction, while arrows (5) to (8) represent types of generation and transformation of cognition (or emotion) or cognitive (or emotional) influence. Sometimes, its authors indicate that the left-hand side corresponds to the "systemic context", and the right-hand side of the figure,o the "social, organizational and cultural context (p.261).

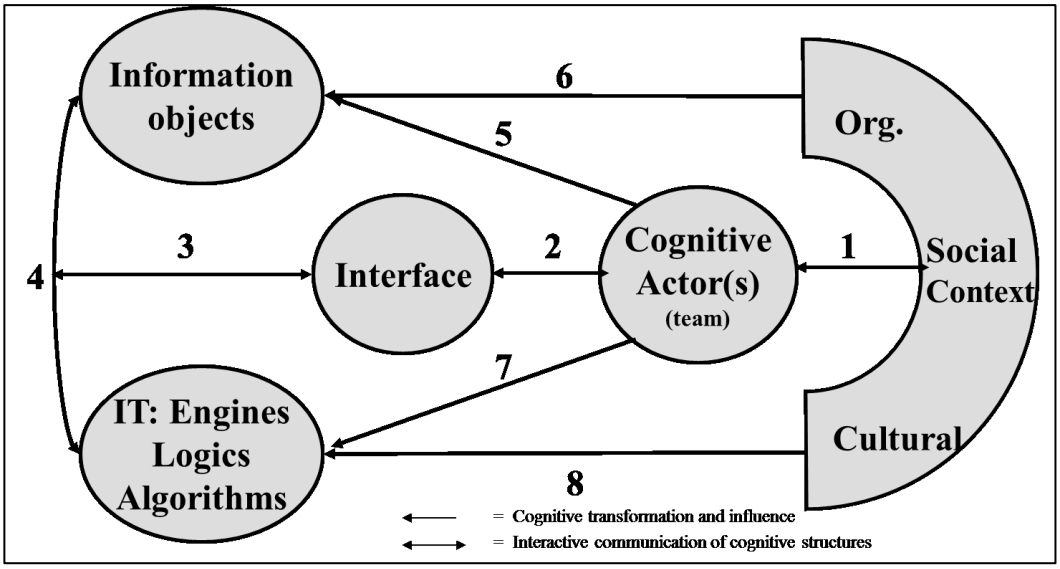

Figure 3.4. IS&R model. "Interactive Information Seeking, Retrieval and Behavioral processes. Generalized model of any participating cognitive actor(s) in context" (Ingwersen & Järvelin, 2005, p.261)

The center of the model is the cognitive actor(s). The authors explain that this is so, since "in human information processing the cognitive model is the individual cognitive space that controls the perception and further processing of external input, for instance, during communication and IS&R" (p.34). The cognitive actor(s) can experience processes of:

- **(1)** Social interaction: between the actor(s) and their past and present sociocultural or organizational context.
- **(4)** IR Interaction between information objects and information technology-based algorithms: this is the core of an information system. It is the interaction that takes place between a human and an IR system, which is an interactive connection between **(2)**-**(3)**: Information interaction between the cognitive actor(s) and the cognitive manifestations embedded in the information technology component (IT) and the

existing information objects through interfaces. This interaction mostly takes place at the linguistic sign level (p.35; Ingwersen, 1996).

- **(2)** Represents the "access and interaction dimension" of the model, properly Interactive Information Retrieval (IIR) in the form of requests, information acquisition, relevance assessments and feedback.
- **(5)** and **(7)**: transformations and generation of potential information as required by the individual actor.
- **(6)** and **(8):** transformations and generation of potential information as required by the social, cultural or organizational context towards the IT and information object components "over time."

Besides modeling IS&R processes, the model is also used as a way of guiding IR research design, by means of the concept of "research dimensions", which is summarized later (Section 3.6.1). In that case, instead of talking about the five components mentioned above, the authors talk about five dimensions: the organizational task dimension, the actor dimension, the document dimension, the algorithmic dimension –which also includes the interface, and the access and interaction dimension –which refers particularly to arrow 2.

As mentioned before, the model is part of an interactive view of IR. IR is defined as the process of searching a collection of documents with the goal of identifying documents pertaining to a relevant topic. Kelly (2009, p. 3) explains that the classic IR evaluation asks the question "does this system retrieve relevant documents?", while IIR, on the other hand, shifts IR research from being totally system centered to focusing on the interaction between the users and the systems. Ingwersen explains that IR interaction (or IIR) is defined:

> "as the interactive communication processes that occur during the retrieval of information by involving *all* the major participants in IR, i.e. the user, the intermediary, and the IR system –the latter consisting of potential information mainly in the form of text and text representation as well as the IR system setting, e.g. database structures and retrieval techniques" (Ingwersen, 1992, p.viii).

Thus, Kelly explains, IIR evaluation asks the question: "can people use this system to retrieve relevant documents?" and concludes that "IIR studies include both system evaluations as well as more focused studies of users' information search behaviors and their interactions with systems and information."

In fact, the integrated IS&R model is inspired by the **cognitive theory of IIR** proposed by Ingwersen (1992, 1996, 2001), and by the cognitive viewpoint, which constitutes the model's epistemological foundation (Ingwersen, 1992, p.viii, ix). The cognitive viewpoint has been developed since the 1970's after the term was originally proposed by M. De Mey[46]. De Mey explains that the central point of the viewpoint is: "that any processing of information, whether perceptual or symbolic, is mediated by a system of categories or concepts which, for

[46] Ingwersen (1992, p.15) explains that probably the term "cognitive viewpoint" was used for the first time by M. De Mey in his epistemological framework presented at the multidisciplinary workshop on the Cognitive Viewpoint, in Ghent (1977).

the information processing device, are a model of his [its] world" (De Mey, 1977, p. xvi-xvii, 1980, p.48, as cited by Ingwersen, 1992, p.15).

The cognitive viewpoint is not to be confused with "cognitivism": the latter is related to strong Artificial Intelligence (AI), and conceives human brains as computers while the cognitive view is associated with soft AI, which assumes that only certain human mental processes can be modeled or simulated. Ingwersen (1992, p.21) explains: "in contrast to cognitivism, the cognitive view attempts to model information processing in terms of 'categories and concepts' at the level of mainly conscious mental states, implying the property of *meaning* –not simply as symbol manipulation." Indeed, in the cognitive view adopted by the IIR discipline, IR is seen as an intentional process of interpretation and cognition, in which the information seeker is responsible for performing the "pragmatic" interpretation (Ingwersen, 1996).

An essential principle that derives from the cognitive view applied to (I)IR is the concept of **polyrepresentation** or "multi-evidence of documents and searchers" put forward by Ingwersen (1992, 2002) and Ingwersen and Järvelin (2005), (also discussed in Ingwersen, 1992, 1996, 2001, 2002; B. Larsen, Åström, & Schneider, 2010; B. Larsen & Ingwersen, 2005).

The principle explains, as suggested above, that there are "a variety of different presuppositions and interpretations of situations made by the different cognitive agents that take part in the processes of information generation and transfer" (Ingwersen, 2002, p.287). The principle further indicates that the consequences for IIR of this principle and view is that there are potential benefits in exploiting combinations of these (redundant) representations, in combination with the different data about their cognitive origins (Ingwersen, 1996, 2012b). This principle applies both to the information space (since information objects embed different representations of their content or meaning left intentionally or unintentionally by their creators), and to the cognitive space since an actor's cognitive or emotional characteristics influence its perception of a retrieval or seeking task. From an IR point of view, the principle relies on the following hypothesis:

> "The more interpretations of different cognitive and functional nature, based on an IS&R situation, that point to a set of objects in so-called cognitive overlaps, and the more intensely they do so, the higher the probability that such objects are *relevant* (pertinent, useful) to a perceived work task/interest to be solved, the information (need) situation at hand, the topic required, or/and the influencing context of that situation" (Ingwersen 1996; 2001; 2002; Ingwersen & Järvelin, 2005, p.208).

Figure 3.5 shows how the principle can be depicted in the case of academic documents. The different IR techniques and logics derived from the principle attempt to "carry out a kind of classic triangulation in the information space *and* in the cognitive space of the searchers" (Larsen, Ingwersen, & Kekäläinen, 2006, p.89). Empirical research tests different algorithms for the retrieval of documents based on the "cognitive overlaps" in the center of the figure, comparing them to sets retrieved independently. The "real novelty" of the principle is the incorporation of the "cognitive space of searchers" into the tests, by extracting evidence "of

the searcher perceptions combining it with the polyrepresentative structures from information space and search engine logics (Larsen et al., 2006).

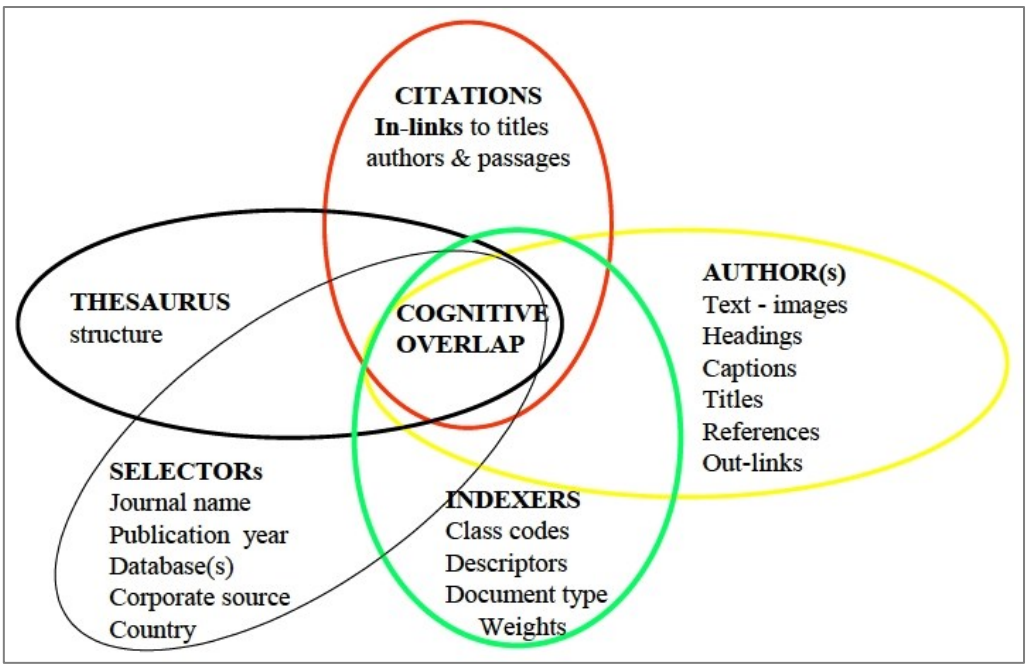

Figure 3.5. "The principle of polyrepresentation in academic documents." (B. Larsen, Ingwersen, & Kekäläinen, 2006)

"Overlaps of information objects retrieved by representations of cognitively and functionally different information structures, by means of one search engine via search keys associated with one searcher statement (e.g., a work task description). Elaborated from (Ingwersen 1996, p. 28; 2002, p. 294; Ingwersen & Järvelin, 2005, p. 207)."

Figure 3.5 shows how the principle of polyrepresentation seeks to benefit from representations with different cognitive origins. In that figure, the "user" or information seeker does not appear yet as generator of representations (this will be discussed later in §3.5.1). The principle of polyrepresentation is central to this thesis, and will be discussed later in relation to annotating-behavior (§3.5.1), media representations (§6.6); and general implications for this thesis research problem (Chapter 8).

Finally, because the selected IS&R framework was not explicitly created to represent or guide the study of information interactions in the form of annotations (although it implicitly encompasses them), the next section will present a preliminary analysis of (new) concepts and potential elements that are necessary for its adaptation.

3.4. Defining information-annotating behavior

Chapter 2 described existing perspectives of moving image annotation from the angle of the IR or more "technical" solutions to the problems of accessing them through different types of metadata. It was possible in Section 2.9 to conclude that there were three broad annotating traditions (indexing, tagging, and *annotating* (glossing)) associated with those perspectives.

Since the goal of this chapter is to provide a theoretical framework for the study of *nichesourcing* (and more generally, about domain-expert annotations), from a "human" behavioral perspective, it is necessary to characterize those three traditions in terms of behavior. Next, since the concept of "annotation" became central to this thesis, it will be analyzed more carefully, and the term "information-annotating behavior" will be proposed as a way to encompass the behavioral aspects of the aforementioned traditions.

3.4.1. Concept of "annotation" and "information-annotating behavior"

In the previous chapter (§2.2.1), the concept of annotation was temporarily defined as a synonym of indexing, or as an equivalent to the term "description" of information, or as a form of creating metadata. At this point, it is necessary to look at it more carefully, and introduce the proposal for an encompassing concept of "information-annotating behavior":

In common language, "annotation" is defined as "a note or notes added to a book or text giving explanations or comments." There is also the act or action of "annotating", which consists on "add[ing] notes to a book or text giving explanations or comments" (" Annotation," 2014). Looking at it as an action, in this broad sense, the actor* performing the annotation could be a human or a machine, or a combination of both[47].

Besides the previous common language definition, the term "annotation" is widely used in the context of information processing in science and scholarship, having different meanings for different communities (Hunter, 2009). For example, it is common to find the following terms in the literature: "scholarly annotation", "textual annotation", "multimedia annotation", "semantic annotation", "linguistic annotation", "gene/protein annotation", "C++ annotations"; as well as the adjective "annotated" for diverse kinds of things, e.g. "annotated bibliography", "annotated version", etc. The uses of the term are multiple, but the definitions about what it actually means are scarce. Ruvane (2006) appears to be the only one acknowledging this conceptual gap.

The "annotating" activity is rooted in a long historical and literary tradition. The most traditional use of the term comes from the universe of books, manuscripts and different types of scholarly texts. Winget (2013) identifies the use of this term in the fields of literary, classical, or religious scholarship, and explains the ways that scholars had for interacting with texts. Winget introduces the case of the "commonplace books," which were private journals used the 17th and 18th centuries, where the reader kept her/his personal comments. In religious scholarship, a very common form of annotation is "marginalia", the annotations in the margins[48]. In an academic context, annotations are defined as one of the "scholarly primitives", which are basic activities or functions common to research across humanities disciplines, over time, and independent of theoretical orientation (Unsworth, 2000). Palmer,

[47] This thesis mostly focuses on the human annotators, and the automatic annotation perspectives were briefly presented in Chapter 2.

[48] This topic is actively investigated in the humanities. An example is a recent workshop, held in 2015, about "Early modern visual marginalia"[(rw)].

Teffeau, and Pirmann, (2009) also include “notetaking” as one of their identified scholarly primitives. As an academic practice, it is usually referred as to “scholarly annotation” (Gerber, Hyland, & Hunter, 2010; Hemminger & TerMaat, 2014). In that sense, Haslhofer et al., (2009) define annotations as “a remark, explanation or interpretation added to the original document. It is a means to make *implicit* structures *explicit* [...] and provides additional meaning to the document or passage it refers to” (p.17). This practice is as old as the ancient texts (Agosti, Bonfiglio-Dosio, & Ferro, 2007), and “has been around for as long as there has been text to annotate” (Winget, 2013)

Parallely, from the IR domain, Hollink (2006) defines annotation as “information that is explicitly related to an item for the purpose of describing the item for future reference and retrieval” (p.1). This definition is representative of this domain, where “annotation” is conceived as a form of metadata. This was precisely the second meaning proposed in a previous section (§2.2.1).

Intensive research by Agosti (e.g., Agosti et al., 2007) and other relevant initiatives (for instance, the LEMO framework by Haslhofer, 2009) are representative of this view on annotation as metadata. For instance, Agosti and Ferro (2005) demonstrate how annotations can be exploited as a useful context in order to retrieve documents relevant to a user’s query. Frommholz et al., (2006, as cited in Haslhofer et al., 2009), also discuss how annotations can be a helpful means for the retrieval of documents in digital library systems. Moreover, a not so obvious type of scholarly annotations, citations, and references, are one of the ways that authors have to offer hints to related works by linking to them in their own productions (Ingwersen, 2002). Ingwersen (2012a) has shown how references can be used to improve IR performance.

Agreeing with this view of “annotation” as a source of metadata, it could be assumed that even if an annotation has not been created with an anticipated retrieval purpose, as indicated in Hollink’s definition above, it may eventually contribute to creating ways of accessing, contextualizing and making sense of information sources and information within the sources when it is shared.

Furthermore, combining traditions from the scholarly way of understanding annotations, and the IR view on it, Groth, Gibson, & Velterop, (2010) introduced the concept of nano-publications, which are defined, in the context of Semantic Web technologies, as “a set of annotations that refer to the same statement and contains a minimum set of (community) agreed upon annotations” (Groth et al., 2010). The purpose of this conceptualization is to enable algorithmic processing of “core scientific statements” in a scientific publication (i.e., of RDF triples such as “malaria is transmitted by mosquitos”), meaning that they can be extracted from the content of a publication and be found and connected. Gradmann (2013) reflects on the implications of this concept both in the sciences and in the humanities, which leads him to revisit the concept of “document,” observing that annotations conceived as statements, are in general an integral part of the scholarly authoring work (p.252). This view is consequent with current transformations in scholarly communication processes and

notions of information objects, which Gradmann has represented in a figure. Gradmann' illustration (Figure 3.6) depicts the traditional scholarly knowledge workflow (left side, in which annotating is one part of a sequence), compared to the current way of "annotating" decomposed pieces that can be interconnected at any moment of the communication process (right side).

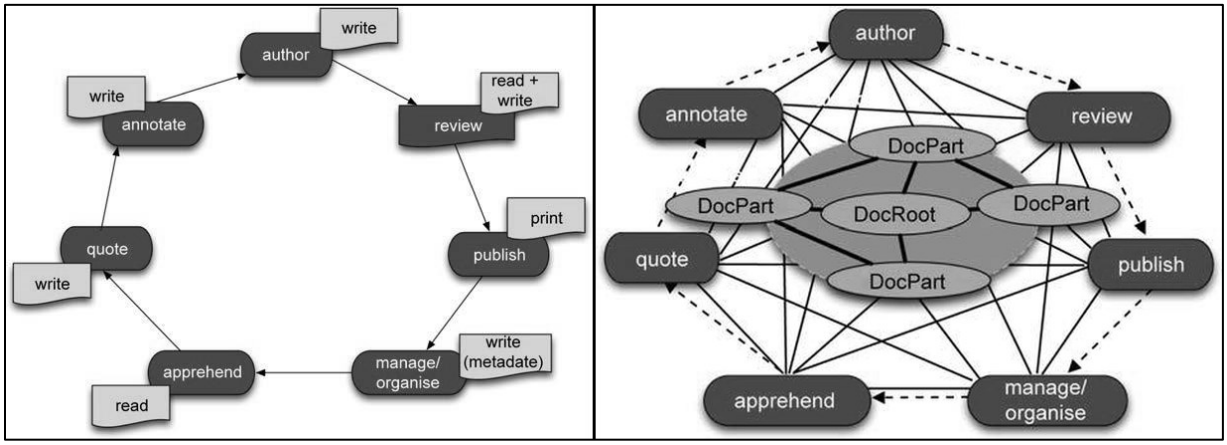

Figure 3.6. The traditional scholarly knowledge workflow vs. the decomposition of the scholarly workflow in genuine digital publishing (Gradmann, 2013)

This ubiquitous view of "annotations" enabled by current web technologies is conveyed in the World Wide Web Consortium (W3C) Annotation Working Group's (1995) definition of annotation as "any object that is associated with another object by some relationship" (W3C, 1995). Also, Waller (2003) distinguishes between annotations in a pre-digital age and a digital age. For him, a digital annotation is "a comment upon a digitally accessed resource as a whole or the contents of a resource, and which itself can be digitally accessed as well as stored."

Similar challenging views to the notion of documents suggested above are put forward by some authors, who challenge traditional views of professionally created annotations (metadata) that only focus on describing (or cataloging) items in order to create surrogate representations. One representative example is Winget (2013), who reflects on the challenge faced by libraries and memory institutions in dealing with "emergent forms of cultural artifacts." The transformations of documents, from fixed entities to more "malleable" cultural materials as a consequence of the digital transition, leads Winget (2013) to claim that it is important that these institutions find ways to organize, access, and preserve interactions from participatory culture, rather than (or only) "things," in order to fulfill their mission and remain relevant. Winget proposes to use the concept of "social reading" to explore these issues. Phelps and Wilensky's (1996) work on "multivalent documents," in which a document is composed of layers and behaviors, is also one important example of this assembled view of documents, annotations, and interactions, as opposed to monolithic documents.

Considering the outputs of traditional forms of annotating (i.e., indexing terms, or more recently tags) as metadata is not uncommon. What is still debatable is if other forms of annotation outputs (for instance, scholarly annotations) are also part of these

representations. Haslhofer et al. (2009) describe this disparity: “the question whether annotations are content, metadata, or even dialogue acts has often been discussed within and between communities […]” (p.17). Ruvane (2006) also indicates this division, explaining that there are two perceptions of annotation that are in opposing ends of a scale in the level of formality: “as a synonym for metadata,” (in the digital world), and “as the reader’s scribbled notes in the margins” (in the analog world). Ruvane continues introducing her proposal for other dimensions that could explain these two different views. For this purpose, she adapts the seven dimensions of annotation proposed by Marshall (1998) and presents her adaptation in a diagram (Figure 3.7), that is a comprehensive view of most types of annotations.

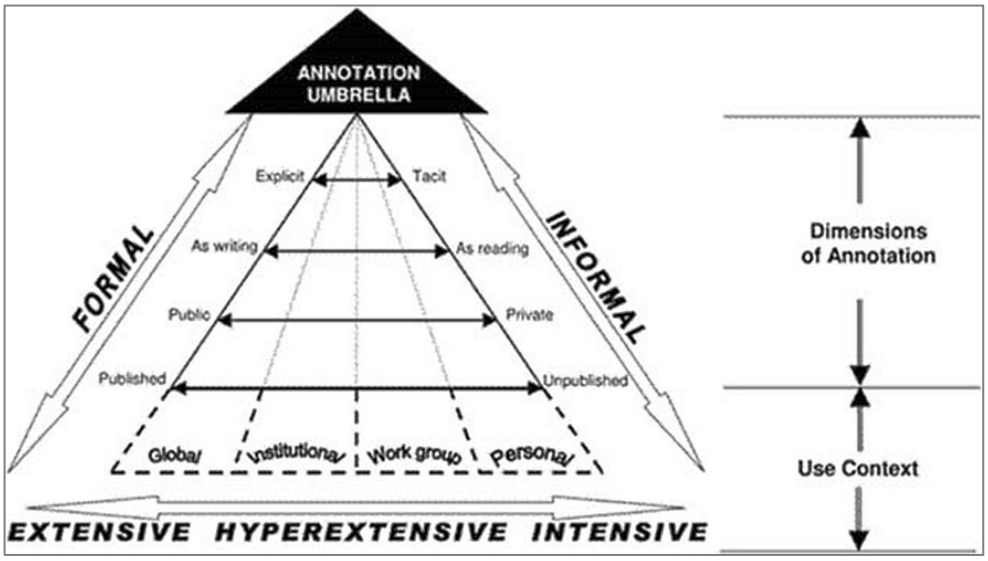

Figure 3.7. The “annotation umbrella” in: Ruane (2006, adapted from Marshall, 1998)

Ruvane’s figure based on Marshall’s ideas (Figure 3.7) represents different dimensions of annotations in a scale (level of formality, the scope of their use or context, and functionality). The novel aspect of Ruvane’s proposal is the integrative approach to two different views on annotations, and the inclusion of Marshall’s categories in a graphical representation that facilitates, as Ruvane indicates, “a holistic and organic approach” to annotation. This approach, Ruvane claims, is important for developing a better understanding of how scholars work and thus improve access to cultural heritage documents.

An additional view in this integrative line of thought is presented by Haslhofer et al. (2009), who take Marshall’s (2000) category of formal and informal annotations, and include “tags” in the distinction. Haslhofer et al., consequently propose to differentiate between: (1) free-text annotations, (2) tags, and (3) structured annotations. An interesting clarification made by these authors is that structured annotations are mostly contributed by domain experts who have precise semantic definitions to provide quality data. The authors do not suggest that these structured annotations are also created by indexing experts (not necessarily experts in a domain), though they also add controlled vocabularies to this structured annotations category.

These integrative views proposed by Ruvane, and Haslhofer and his team, actually correspond to the three main traditions of annotating moving images identified in the previous chapter (§2.9) (i.e., indexig, tagging, annotating (glossing)). Thus, proposing a concept of "annotation" for the moving image domain which includes those three types seems not only possible, but necessary, as a continuation of these authors' ideas, and also as a way to facilitate their study as forms of human behavior. This comprehensive view on annotation, as Ruvane and Haslhofer have argued in each case, would help both to develop a better understanding of the phenomena, and serve as a way to observe the means to facilitate access based on their consideration as forms of metadata.

Consequently with this idea, the term "annotation" is defined in this thesis in a broad sense, as a way to encompass, in a wider perspective (which goes beyond formal cataloging or scholarly practices alone), all different activities in which actors* create new information (in the form of indexes*, tags*, keywords*, comments, notes or other documents derived from an initial information source with which they interact). These annotations can be created with or without the purpose of future retrieval, but they can be considered forms of metadata as Agosti et al., (2005)and Haslhofer et al., (2009) have indicated.

This holistic definition –as well as several ideas related to the broad view of information representation described above–, find their correlation in IIR theory, where the concept of polyrepresentation and empirical studies based on it confirm the need for this general (yet differentiating) view of the several types of annotations. This idea is central to this thesis, and will be explained later in this chapter (§3.5.1).

Accordingly with the previous definition of "annotation," this section finalizes by proposing an encompassing term for the study of these phenomena, which is "information-annotating behavior." This term will be used in the remainder of this chapter and thesis in this comprehensive view just exposed, and will be suggested to be included as one area of studies of information-use behavior (§3.7).

This section has presented one part of the analysis required to adapt the IS&R framework for this thesis' investigation by proposing the encompassing definition of "annotation" and "information-annotating behavior", which facilitates grouping the different perspectives of moving image annotation found in Chapter 2, hence becoming a phenomena that can be explained by a macro-theoretical framework. Next, a second part of the analysis is done by identifying the main elements and definitions relevant to the study of information annotating-related activities.

3.4.2. Elements for the study of information-annotating behavior

The three main annotating traditions identified before (§2.9) will be explored more in detail in this section through a literature review[49]. This review intends to identify which are the main

[49] The literature review in this section is not exhaustive but comprehensive of three different topics (i.e., indexing,

elements for the study of information-annotating behavior. The elements that are identified through this review will be used for informing the adaptation of the selected IS&R framework that in turn will frame the aspects to be analyzed in this thesis investigation in relation to moving image annotating behavior. The different aspects in this section are identified with the letters AB (i.e., annotating behavior) and a consecutive number. They are ordered in relation to the attention they seem to have received in the literature[50]. Section 3.4.3 includes a summary table where each aspect is located based on its "research dimension" (this concept will be introduced in §3.6.1).

3.4.2.1.Indexing behavior

Traditionally the focus of indexing studies has been the outputs of the indexing activities (indexes, keywords, metadata). However, more than thirty years ago, Schwartz (1977) identified publications that had a different focus on indexing: rather than researching about the outputs of the indexing process, those were focused on the process itself as one of the variables of indexing quality. As she said back then, "the major part of indexing research has dealt with the effects of indexing on IR systems in terms of performance measures. However, a substantial body of literature exists which is concerned with indexer behavior and the nature of the indexing process" (p.D5). Chu & O'Brien (1993, p. 439) also observed this issue, stating that "most studies about indexing are in fact about indexes. This sentiment was expressed by Jones in 1976 and still holds true".

Schwartz was one of the first ones (if not the very first author) in referring to these phenomena as "indexing behavior" and wrote what seems to be the first literature review on the topic. In her review, indexing behavior indicates the different activities involved in the indexing process that, in her words, comprises the subject analysis of document content by the human indexer (p.D5).

Studies about indexing behavior are not scarce, even the term itself is rarely used[51]. For that

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tagging, annotating). The search was carried on with the keywords "annotation behavior", or "annotating behavior", also with the British variant "behaviour". After identifying the three main types of information-annotating related activities, those specific types were reviewed by searching with the keywords "indexing behavior", "tagging behavior" (plus "commenting") and "annotating" plus "academic", "scholar", "humanities", "education". The terms "indexing process" and "human indexing" were added for the first type later. Also, variants such as "indexer" or "tagger" were used. These words were sought in the title and keywords (occasionally in the abstract when no results were obtained). These three kinds of behaviors (indexing, tagging/commenting, and scholarly annotation) were confirmed to be the most relevant human annotation behaviors in the literature exploration. The search was performed in the databases Scopus, LISA, LISTA and ERIC, with no time or language restrictions but limited to academic articles and conference proceedings. The conference proceedings of ISIC (Information Seeking in Context: The Information Behaviour Conference), IiIx (Interactive Information and Retrieval), the Annual Review of information Science of Technology, the Encyclopedia of Library and Information Sciences (published by Taylor and Francis), and the Digital humanities Conference proceedings were revised for relevant publications. More relevant references were chainned from the selected results.

[50] Because of the exploratory purpose of this review, this estimation was done manually, with no quantification or citation analysis processes applied.

[51] A search in the LISA, LISTA and Scopus databases for the exact terms "indexing behavior" or "indexing behaviour" in all fields and with no restrictions gives back 16 results, from which only half were related to indexing behavior, as a human activity.

reason, the remainder of this section identifies the aspects covered under such a term. A useful point of departure is the comprehensive categorization made by Schwartz in 1977 of the different factors that belong to the study of indexing behavior, which she summarized in: the context of indexing; subject analysis; consistency; indexing operations; and indexing theory. Schwartz also finds in Oliver et al. (1966, as cited in Schwartz, 1977) and Zunde and Dexter (1969, as cited in Schwartz, 1977) a number of factors that could eventually have an influence on indexing behavior. She reports on four categories: personal factors; procedural factors; document-related factors; and environmental factors. Combining all these elements with new ones found studies after Schwartz, the following categories summarize what indexing behavior studies to date have investigated, or suggest should be researched:

AB.1. Indexes' consistency (output) related factors. Schwartz finds diverse studies related to indexing consistency, mostly of a quantitative and experimental nature. She reports on studies with different focuses: (a) comparing consistency between manual and automatic techniques, (b) looking at measures of precision in the use of free selected terms as opposed to controlled vocabularies assigned by subject experts, (c) comparative studies of keyword indexing by indexing professionals and subject specialists, and (d) studies with a less common view on consistency at the time: for instance, consistency on perception of what is indexable matter as compared to consistency in choice of terminology.

After Schwartz, intensive attention has been devoted to interoperability (i.e., consistency) standards for automatic metadata aggregation, but the studies on indexing consistency from the perceptions held by (human) indexers are scarcer. One relevant study in this scope, within the visual domain, is Tirilly et al., (2012) who analyzed people's perception of similarity based on their assessments and the use of similarity measures based on their perception. Other research works about indexing consistency that rely on behavioral aspects are described later in AB.5 "Personal factors."

AB.2. Procedural factors ("indexing operations"). In Schwartz terms, these are the factors related to "the task of index term assignment" and the "decision-making behavior" (p.D9). Aspects in this category include indexing routines, or indexing as a decision-making process (for instance, the steps involved in thesauri consultation and use), indexing systems, such as vocabulary, structure, method, rules, aids, devices, policy constraints as to exhaustivity and specificity. The term "indexing process," also used by Schwartz, is more common in the literature after her review, and the subject of renowned books, one of the most important ones being Lancaster' "Indexing and abstracting in theory and practice" (ed. 1991/1998/2003). After Swartz most works on indexing as a human activity have been concerned with the construction and use of Knowledge Organization Systems (KOSs), or collaborative ontology construction in specific domains (e.g., Farquhar, Fikes, & Rice, 1997; Missikoff, Smith, & Taglino, 2015), or in their practical application in the form of cataloging and indexing manuals, rules or guidelines. Important "behavior-oriented" works include Soler-Monreal and Gil-Leiva (2011), who evaluated the influence that the controlled vocabulary structure (list of descriptors, standard thesaurus, and augmented thesaurus) had on

consistency in the selected terms by indexers with different background and experience.

A unique work about the "indexing operations" from an IB perspective is Smith and Kells (2005) book "Inside Indexing: the decision-making process." In this invaluable text, the authors disclose their procedures, thoughts, decisions and personal choices in doing this kind of intellectual work. The aspects they focus on include their own personal traits and motivations as indexers; the influence of their perceptions about the audience in their index development; their way to collect information and connect it to the indexed text, their syntactic choices and the evaluation of consistency. Finally, Mai (1999, 2000, 2001, 2005) has intensively and critically researched the human indexing process, approaching it through disciplines such as linguistics and philosophy.

A rare report, "Annotation: a lost art in cataloging" (Bowman, 2007), refers to a disappeared common practice of adding annotations to bibliographic descriptions. The author gives a historical view on this practice, common in public library catalogs in early twentieth-century Britain, which were added for the purpose of clarifying titles, or providing further information about the subject or content. There were two manuals on this process. The practice became rarer after World War I. Bowman sees a parallel with today's use of a table of contents* information in online catalogs. But this idea has more important implications in relation to the broader concept of annotation as is explored in this thesis since it suggests the need for annotating (glossing)-related activities during indexing or cataloging.

AB.3. Indexing process (subject analysis). Subject analysis is considered the most important part of the indexing process, and thus is investigated as a separate topic. Schwartz includes here research related to the stages of the indexing process (this includes the subroutines involved) and on the determination of the document's "aboutness." Shwartz suggests that this topic can be approached in two ways: from a theoretical perspective, that is, by conceptualizing the "aboutness" problem; and from a practical perspective, providing guidelines about how to represent subject content or "aboutness."

Digger (1973, as cited by Schwartz, 1977) found at least twelve possible subroutines of the subject-indexing process: scanning of the text, assessment of the nature of the document, identification of the concepts, relation of the concepts to user requirements, selection of concepts to be indexed, listing of concepts to be indexed, formulation of tentative subject headings, translation into index language terms, conversion into a code, weighting, selection of access points, and checking of previous decisions. After Swartz review, one of the most dedicated authors to this topic is Jeans-Erick Mai (e.g. Mai, 1999; Mai, 2000), already mentioned, who focuses on the subject-indexing process from a semiotic point of view.

In relation to theoretical studies on the "aboutness" problem, there are also few but renowned works from Schwartz' times and after, for instance Foskett (1977), Hutchins (1978), Ingwersen (1992), Hjörland (1997), and also overlapping studies with the "indexing theory" body of literature that will be described later. This issue is gaining interest in the context of automatic indexing (e.g. Fujita's (2000) work "Reflections on "aboutness", related to the

TREC[52]-9 Evaluation experiments), and in relation to visual resources (e.g. the study by Arastoopoor and Fattahi (2012) on users' perception of aboutness and ofness in images based on Panofsky's theory). An important work is presented by Anderson and Pérez-Carballo (2001a, 2001b), who made a comprehensive literature review on the differences between human intellectual indexing and automatic indexing techniques from the point of view of the cognitive analysis required.

AB.4. Document-related factors. These are related to the format, presentation, vocabulary, or authors' points of view expressed in the documents. After Schwartz this topic has gained attention, and several works have been published on the subject, mostly textbooks or manuals on indexing that apply general techniques to specific document types (e.g. images, literary works) or domains (science, humanities). As an example, Pejtersen (1994) investigates how the intrinsic characteristics of fiction literature influence the needs for a specific indexing process.

AB.5. Personal factors. These are related to the human indexer, such as age, sex, background, indexing experience, acquaintance with an information processing system and users, motivation, interest, aptitude, etc. Saracevic (1991), synthesizes the findings until that date about the influence of individual differences in information retrieval tasks. It included research about individual differences' influence on indexing consistency, relevance judgments, selection of subject headings, selection of search terms, and search retrievals. More recent works in this aspect are done by Bolton, Faulkner, Peebles, and Vaudrey (2005), who describe personal motivation and background of four professional indexers. Lopes (2002) is one of the few doing fieldwork to observe the factors that affect indexers during their "content analysis of documents." He researched the influence of subjectivity, previous knowledge, and academic and professional background in their activities. One of the key personal factors is that of cognition, although studies of the influence of those factors in indexing are scarce. In general, theoretical studies about indexing as a cognitive activity are scarce (as Mai, 1999 also pointed out), although some works with a broader scope provide insights into this activity (AB.6).

AB.6. Indexing (categorization) theory. In Schwartz's times, studies on indexing from a theoretical perspective were too rare. One of the few is Landry ([s.d.], as cited in Schwartz, 1977), who proposed a general theory of indexing as the basis for the formulation of a theory of information storage and retrieval. Important works produced after Schwartz (1977) were mentioned above in relation to subject analysis, but studies of human indexing from a theoretical perspective (in relation to behavior or cognition) are generally scarce. A few exceptions are Rosch, Mervis, Gray, M, and Boyes-Braem, (1976 as cited in Schwartz, 1977), or more recent works on classification or concept theory, which include: Sekhar & Ekbote

[52] The Text REtrieval Conference (TREC)[(rw)], co-sponsored by the National Institute of Standards and Technology (NIST) and U.S. Department of Defense, was started in 1992 as part of the TIPSTER Text program. Its purpose was to support research within the information retrieval community by providing the infrastructure necessary for large-scale evaluation of text retrieval methodologies.

(1992); Bowker and Star (2000); Medin and Aguilar (2002); Beghtol (2003); Stock (2010); and Smiraglia (2014).

AB.7. Environmental factors. These include the physical surroundings, work patterns, and the like, associated to the indexer when performing this activity Schwartz finds that there was more concern for procedural factors and studies on indexing consistency in the literature at the time than in these environmental factors. In an updated review, there is no evidence that this has changed significantly, since even the studies on IB on workplaces, for instance, at memory institutions where indexing activities are part of the work tasks, do not seem to be reported. An important exception, in relation to the study of "work patterns," originates in the research area of "Cognitive Work Analysis" (CWA) (Rasmussen, Pejtersen, and Goodsetein, 1994, as cited in Albrechtsen et al., 2002), which suggest that the indexing task, usually performed by information professionals individually, could be developed as part of collaborative work, and by taking into account the socio-cognitive factors of the indexer as an individual (e.g., the indexers background knowledge, and the awareness of the needs of the user community), and as a member of an organization (i.e., a film archive). A highly relevant study for this thesis in the film domain which applies CWA is the "Collate project". Albrechtsen, Mark Pejtersen, and Cleal (2002) proposed to take into account the aforementioned socio-cognitive factors, and applied CWA to the study of the empirical work of a group of indexers in a specific film archive. The authors observed the film indexing task that take place in the institution and defined this as a constant decision-making process in which "ongoing negotiation of interpretations of work" take place (p.90). They also paid attention to the use of conceptual tools, which are for instance the cataloging rules and database formats used for the indexing activity.

3.4.2.2.Tagging, key-wording behavior

As in the previous case about indexing, most studies about social tagging focus on the analysis of the outputs of the tagging process, that is, on the tags. Similarly to the case of indexing behavior, studies about tagging behavior are not scarce, but the term itself is rarely used, or is used to refer only to the study of tagging outputs. In the reviewed literature, this term is not explicitly defined either. However, studies about behavioral aspects of tagging seem to be more numerous that about indexing.

Peters (2009, p. 184), who has written one of the most comprehensive reviews on social tagging, implicitly suggests a possible definition of tagging behavior, as the study of the relationships between users and tags. Gupta, Li, Yin, and Han, (2010) also offers a comprehensive view on tagging research issues in which several studies would fall under tagging behavior studies: topics like why people tag, what influences the choice of tags, how tags are created, how to choose the right tags for recommendation purposes. These and other topics that fall within the scope of tagging behavior research include the following:

AB.8. Tags (outputs) related factors. Most studies that claim to be about "tagging behavior"

focus on analyzing and evaluating the resulting tags, or in processing the resulting folksonomy, looking at patterns in the tagging outputs (the tags plus or in combination with information from the creators of the tags, and/or in relation to the documents being tagged). The perspective, in this case, is mostly of a quantitative nature. The issues that predominate in the literature are, for instance, about tag allocation frequency and distributions, types of tags (see also §5.3.5), tags word composition and/or tags semantics, tags alignment with other vocabularies or tag ontologies, and "tagometrics" (e.g., Ding et al., 2009). Likewise, a behavioral focus in the study of tags is part of the studies about similarities among users who choose the same tag and the social structures associated to relations between tags (e.g., Marvasti & Skillicorn, 2008). The focus on "users" is also part of the studies that attempt to derive user profiles from the tagging outputs (e.g., Szomszor, Alani, Cantador, O'Hara, & Shadbolt, 2008), also by combining user information from a person's participation in different social networks and the individual's tagging history and data (e.g., Cantador, Szomszor, Alani, Fernández, & Castells, 2008). Innovative approaches propose to enhance personalized retrieval by using users' "social media data" (e.g., via query expansion, such as in Zhou, Lawless, & Wade, 2012).

AB.9. Motivations for tagging. Undoubtedly the topic of motivations for tagging is the most explored in relation to tagging behavior. This is not strange, since tagging is a voluntary action, as opposed to the labor-oriented indexing equivalent. Hammond, Hannay, Lund, and Scott, (2005) identified several reasons for tagging content on the web, ranging from a "selfish" perspective, in which people tag their own content for their own retrieval purposes, to a more "altruistic" perspective, "where the user is tagging others' content for yet others to retrieve." Marlow, Naaman, Boyd, and Davis, (2006) found that the user behaviors are motivated by personal and social motivations, and also by the forms of contributions allowed by a system. Other user incentives include future retrieval, contribution, and sharing, attracting attention, playing and competing, self-presentation and opinion expression. Likewise, Ames and Naaman (2007) proposed a taxonomy of tagging motivations from users of two image systems (Flickr$^{(rw)}$ and Zone Tag$^{(rw)}$) presented as a matrix that crosses function (organization and communication) versus sociality (from self to public, passing by a close social circle).

Contrarily to other studies, Marvasti and Skillicorn (2008) found that people mainly use tags for their own informational needs that are personal rather than social. Siorpaes and Simperl (2009) also cast doubt on the interest of internet users in creating semantic content (a prerequisite for the large-scale adoption of semantic technologies); the authors see barriers in current applications for semantic web technologies, requiring skills that are not common among users, and the lack of incentives and motivations for them to contribute. To overcome these disadvantages, there is active research in the use of tagging games (see also Section 2.6, and Chapter 5).

Angus and Thelwall (2010) investigated what motivates people not only to publish images in Flickr but to tag them, confirming that tagging motivation is related either to personal or

social factors. Strohmaier, Körner, and Kern, (2012) look at tagging motivation empirically, by trying to derive quantifiable variables for studying their correlation with resulting tags and folksonomies; the authors found a significant difference between taggers that tend to categorize and those who tend to describe the resources.

More recently, Eccles and Greg (2014) compared the motivations of "tagger volunteers" between the projects "Galaxy Zoo"[(rw)] and "Your Paintings Tagger" [(rw)], finding the following reasons for users' participation: interest in the paintings, joining a community/working together, pleasure of contributing to art research, discovery, fun, pleasure of contributing to a national project, learning, teaching, and interest in the vastness of the collection.

AB.10. Tagging systems. Studies about tagging systems proliferate. Several studies investigate how tags can be used in IR systems, for instance on searching with tags, using tag clouds for exploratory search, applying recommendations in tagging systems and other IR systems, searching by using "community" information, etc. Some authors have tried to create typologies of tagging systems. For instance, Voss (2007) updated the taxonomy proposed by Marlow et al., (2006). Less common are studies looking at how system functionality influences tagging behavior (one early study is Sen et al., 2006). Heckner et al. (2008), confirm that, indeed, system functionality plays a role in the users' tagging behavior.

AB.11. Media-related factors. There are several studies that investigate the application of tagging to specific media and systems (images, video, texts, scientific documents, etc.). One example of this type of study is Golbeck, Koepfler, and Emmerling, (2011), who looked, among other things, at the type of tags that users assign based on the type of image being tagged and other image features.

AB.12. Tagging applied to specific domains. Different studies analyze tagging outputs or behaviors in specific organizational or social settings. For instance, Good, Tennis, & Wilkinson (2009) observe tags characteristics and alignment in relation to scientific documents. Ådland and Lykke (2012) novel investigation looked at the role of social tags in supporting patients' information search in a medical website. A scholarly communication approach is taken by Gherab-Martín (2011) who investigates the role of tags in creating links in the scholarly communication process to favor interdisciplinarity.

***AB.13. Perceptions and attitudes about tagging*.** Since tagging is a relatively new practice compared with traditional indexing, a personal factor that is of interest for some authors is how this practice is received by indexing experts. Bianco (2009) looked at how medical librarians used and perceived social tagging. Kim and Rieh (2011) is a highly interesting study from an IB perspective, reporting on an interview-based study of the beliefs held by participants about the origin and use of web tags. Gao (2013), in turn, looked at how students perceived and used social tagging for learning purposes.

AB.14. Tagging process as a cognitive activity. Phuong (2011) is one of the few studies about tagging as a cognitive process. It is a master thesis in which the researcher studied tagging behavior processes from the point of view of the actions, behaviors, cognitive aspects

and factors that have an influence on the tagging activity. At a more abstract level, Sinha (2005) reflects from a "cognitive psychology" point of view about the cognitive process that takes place during tagging, observing that the cost of tagging is low compared to categorization; she highlights that tagging systems should be designed to favor these types of intellectual activities that humans perform during tagging. In relation to these cognitive processes, Fu, Kannampallil, Kang, and He, (2010) also found that there is a semantic imitation behavior in the taggers, "the model predicts that (1) users who can see tags created by others tend to create tags that are semantically similar to these existing tags, demonstrating the social influence of tag choices; and (2) users who have similar information goals tend to create tags that are semantically similar, but this effect is mediated by the semantic representation and interpretation of social tags." Golder and Huberman (2006) also found this imitation phenomenon in tag selection. Similar studies look at how existing tags support the tagging process or interaction, finding a positive influence from the "wisdom of the crowds" in tag selection (Bar-Ilan, Zhitomirsky-Geffet, Miller, & Shoham, 2010).

AB.15. Familiarity with tagging. Sen et al. (2006) described the main influencing factors on tagging, which are "personal tendency" and "community influence"; the first one covers factors like experience with other tagging systems, knowledge and interests; in turn the notion of community influence is based on the theory of social proof, which states that people act the way they observe others acting" (Cialdini, 2001, as cited in Heckner, Mühlbacher, & Wolff, 2008). Lee, Goh, Razikin, and Chua, (2009) found that high familiarity with the concept of tagging, web directories, and social tagging systems are significantly and positively associated with high tag effectiveness for content sharing. The work by Lin and Chen (2012b), also considers familiarity with tagging as one of the factors of the online social and cultural capital that influences tagging behavior.

AB.16. Familiarity with the source. Golbeck, Koepfler, and Emmerling, (2011) looked, among other things, at the type of tags that users assign based on their past experience with an image. They found that users' experience, as well as the type of image being tagged, creates significant differences in the number, order, and type of tags (p. 1750). Bar-Ilan et al., (2010) also experimented with this factor by using a controlled group which was provided more time to get acquainted with the source to be tagged, finding that this factor does play a role in the tagging behavior.

AB.17. Background knowledge and expertise level. Similarly to the case of indexing behavior, in which most studies about tag consistency focused on personal factors such as background knowledge, some tagging-related studies have investigated the influence of the tagger's knowledge and background in the tags and tagging process. Dong and Fu (2010) investigated how the culture of an individual influences his/her selection of tags. Lin and Chen (2012a) used Bourdieu's concepts of "social and cultural capital" for investigating how the users' previous knowledge and experience with tagging and tagging systems influenced the participants' performance. The authors found a positive correlation between expertise and culture of the participants in their tagging behavior (see also §5.3.2).

AB.18. Participation styles. Several studies look at how the user performs the tagging activity based on cognitive characteristics (which are intertwined with the users' tagging motivation). For instance, Raban, Ronen, and Guy, (2011) within the context of an enterprise people-tagging application, distinguished between users who initiate an activity and those who respond to an activity. This distinction was associated by the authors with the preferential attachment theory that they used for examining which type of participant contributes more to the process of tagging. In an empirical investigation related to studies on cognitive activity, Körner, Kern, Grahsl, and Strohmaier, (2010) found that there is a difference in the type of participation from users depending on their cognitive performance; the authors proposed two categories based on this distinction: "describers", i.e. users who use tags for describing resources, and "categorizers", i.e. users who use tags for categorizing resources. (See also §3.5.1 for a discussion related to this aspect).

AB.19. Tagging literacy. Moura (2009) introduced the use of the term "tagging literacy", which includes the study of classificatory culture and informational identity in open virtual exchange spaces. Kim (2013) presents an innovative approach to tagging behavior studies, by proposing to train freshmen in medical education on how to tag and/or index medical images, which not only helps them to develop skills in analyzing the contents (subject matter) of images, but also improves the quality of image legends in publications, and the discoverability of medical images on the web. Likewise, Maggio et al., (2009) had also explored the use of social tagging in teaching students how to use the "Medical Subject Headings" (MeSH). In the audiovisual domain, Barber (2012) reflects on the use of, not only tagging but other ways of annotating online digital content which can have positive consequences by enhancing active user-engagement and interaction with media. (See also §2.6.2 where a current semi-automatic perspective of "underlying" tagging-literacy is presented).

AB.20. Theoretical/Philosophical views. Even though in the early years of tagging research it was more common to find investigations about practical applications than on philosophical implications (as also Smith, 2007, p.vii, observed), studies about tagging in a broader framework of collaborative economy are more frequent nowadays. In an early study, Weibenger (2008) reflected how social tagging is a revolutionary phenomenon in the information landscape. One example of current research in this category is Fox and Reece (2013), who use Derrida's concepts to explain the characteristics of social tagging.

3.4.2.3.Annotating (glossing) behavior

As it was discussed in Section 3.4.1, annotating, as in note-taking or glossing acts, is associated with "text annotation" (Winget, 2013). Studies on how people annotate for academic or scholarly purposes with the aim of providing better web services seem to have become more frequent since the early nineties, although the term "annotating behavior" is scarcely used[53]. More common, though, are studies about contributions by casual users done

[53] A search in the LISA, LISTA and Scopus databases (on Feb., 2015) for the exact terms "annotating behavior" or

in the context of the social web, for instance, by adding a comment, a bookmark, or about all the types of interactions that occur in those environments in relation to objects, information, and people. Except for a few cases, the literature in this section was reviewed only when it made emphasis on the concept above (annotation as a "scholarly" or "glossing" practice).

AB.21. Annotation functionality (tools) related aspects. Most studies on scholarly annotations seem to take place in the context of requirements' elicitation studies for the development of the graphical user interface for annotation tools, for instance, to develop digitally augmented paper technologies (Decurtins, Norrie, & Signer, 2003). For that reason, human-computer interaction aspects with information processing systems seem to be more prominent. However, even though several qualitative studies in the social sciences use information processing systems for annotating research material (e.g., QDA systems), no studies were found about the annotating behavior of researchers using them. But there are several potential issues to investigate, for instance, whether there are "coding" styles, or how the facility of "coding" influences analytic and interpretive activities, what Lyn Richards commonly referred to as 'coding fetishism' (Bazeley & Jackson, 2013). Likewise, reference management software (e.g. "Zotero", "Mendeley") could be considered as one type of annotation software. Researchers' practices using these systems are less scarce than in the previous case, although they are done in the framework of personal information management (PIM) or information literacy studies. (See also §8.4).

AB.22. Annotating habits and motivations. Similarly to the case of tagging, researchers have investigated the reasons why people annotate, how this is done in practice and how the digital environment has influenced these practices. Examples of this research include an ethnographic study of college student paper-based note-taking habits during lectures (Van Meter et al., 1994, as cited in Mu, 2010). Liu (2005) studied how **reading behavior** has changed in the digital environment as compared as to traditional analog reading forms. One of the aspects she looked at was the frequency of annotating, or at the practice of highlighting printed documents versus electronic documents. Liu found that these traditional and common patterns in the printed environment had not migrated or evolved in the digital environment.

From 2004 to 2005, the "Annotation of Structured Data Project"[(rw)], conducted by researchers at the University of North Carolina at Chapel Hill School of Information and Library Science and Microsoft, investigated daily annotation practices of scholars, professionals, and general users, publishing several papers. One of those publications focused on studying the behaviors of web users when annotating the sources. The authors found three recurrent forms of annotations on printed documents (i.e., text selection and emphasis, association building, and document re-segmentation), being text selection and association building through notes of symbols the dominant forms of annotation on the web (X. Fu, Ciszek, Marchionini, & Solomon, 2005). Indeed, Haslhofer et al., (2009) observed that still, "annotation capabilities

"annotating behaviour" in all fields and with no restrictions gives back 16 results, from which only half used the term in relation to annotating behavior as a human activity.

and the possibility to freely and easily organize and categorize the physical documents on their desk are among the essential reasons why people still tend to print out documents and read them in paper form."

Moreover, Palmer and Newman (2002) report on a project to identify the differences between the work of different communities of scholars and researchers, across the sciences, humanities, and social disciplines. The main aim was to look at how information systems and services can better support interdisciplinary work. The authors found out that among humanists reading and writing are highly interconnected activities, and note-taking plays an important role in this connection:

> "Reading for writing is an integrated practice that involves numerous information activities. Writing is stimulated through reading, and note taking and annotation frequently accompany reading. Notes may be written out or typed on a computer, and for a single individual the organization and storage of notes may vary from piles of scrap paper on the floor to structured file folder systems and elaborate databases. Notes fix the intellectual work of reading in a primitive form for future development. As scholars begin to compose more formal written works, they are not just documenting their ideas. The act of writing is formative" (p.100).

The W3C Open Annotation Community Group proposes a typology of annotation motivations as part of their open annotation data model, where motivations become SKOS concepts (Sanderson, Ciccarese, & Van de Sompel, 2013b). The high-level list of motivation concepts will be discussed later (§3.5.1).

AB.23. Types of annotations. An important work in defining the types of annotations in a scholarly way is done by Marshall (1998, 2000). She proposed a complete categorization including several dimensions: distinctions of form (formal/informal, explicit/implicit); the function of the annotation (writing/reading, extensive/intensive[54], and permanent/transient); and intentionality of the annotations (published/private and institutional/workgroup/individual), the latter referring to the intended audience for the annotations. Ruvane (2006) represents and updates these categories (Figure 3.7). Likewise, Fogli, Fresta, & Mussio, (2004), suggested a distinction between "within the document" (e.g., highlighting) to "stand alone" (e.g., notes on a piece of paper) annotations. In addition, a special type of glossing behavior in the context of the social web is that of adding comments during saving, bookmarking, sharing or tagging activities. Works like Van Hooland (2006), or Madden et al. (2013), are representative and one of the few on "commenting behavior" (see also §2.5.1).

Also as a consequence of the digital turn*, some studies investigate the changes that these types of annotations experience when they are shared, for instance in online environments[55].

[54] Marshal's distinction between extensive/intensive annotations, can be related to the concept of "close" and "distant" reading (§7.6.2.3).

[55] In the scientific domains, current research investigates the changes from traditional lab notebooks kept during experimental research and their conversion into digital ones, this was the topic of a recent ASIS&T webinars, entitled "Electronic Lab Notebooks (ELNs): Capturing Laboratory Activity As It Happens".

An important conclusion was reached by Marshal and Brush' (2004) study, who found that "personal annotations underwent dramatic changes when they were shared with others." Similarly, Hastreiter, Burghardt, Elsweiler, and Wolff (2013) looked into the frequencies of different forms of annotations in an academic environment, finding that certain forms (for instance highlighting instead of underlying) are used more frequently in the digital context than in printed media. (See also AB.26).

AB.24. Domain related aspects. Distinctly to efforts described above in the information technology-related aspects (AB.21), which are abstract and community independent, other authors focus on understanding, from a group's perspective, what the role and workflow of the annotations is and how abstract models and tools should be developed according to the specificities of the community they serve. Research in this area comes mostly from education disciplines, in relation to students' annotations behavior in the context of learning and reading comprehension, as well as their role in knowledge sharing in collaborative learning environments (e.g., Gao, 2013; Hastreiter et al., 2013; Tseng, Yeh, & Yang, 2014; Waller, 2003). Some studies have looked at how different types of annotations are produced in the context of analytical activities (Marshall, 2000). In some cases, these studies propose typologies of annotations, but the most important aspect is their focus on the context, the function of the annotations within work tasks or learning activities.

Winget (2007) presents an important case of domain-oriented annotating behavior studies. She conducted an ethnographic study to examine the annotating behaviors of musicians working with musical scores for the purpose of performance, finding out that annotating is a very important part of the rehearsal process.

Among scholars, mostly in the humanities, social sciences, and linguistics, one of the most common ways of annotating for purposes beyond personal use is through text encoding or markup. The "Text Encoding Initiative" (TEI) [(rw)] is an international project that proposes and maintains a standard for the representation of texts in digital format. It consists of a set of tags, named elements and guidelines for their use in analysis and publication of electronic texts among their users community. In relation to this, a relevant concept originating from the humanities domain, is that of "hermeneutic markup" (Bögel, Gius, Petris, & Strötgen, 2014), which refers to a way of encoding content with an interpretative intention in mind. As the authors explain, hermeneutic markup "is not limited to describing aspects or features of a text that can be formally defined and objectively verified. Instead, it is devoted to recording a scholar's or analyst's observations and conjectures in an open ended way." The "Markup Analysis Project" [(rw)] is an initiative that investigates how this type of annotation (markup and hermeneutic markup) relates to other documentary practices (Scifleet, Williams, & Cole, 2009). However, instead of behavioral aspects, in the context of scholarship, the most important current efforts center on providing frameworks for scholarly methods used in this disciplines, as it can be seen in the "Scholarly Methods Ontology" proposed by DARIAH-EU (Constantopoulos & Munson, 2013), or in the "Scholarly Domain Model" proposed by Schreibman et al. (2013), which seeks to represent some of the most generic humanistic

functions which resemble scholarly activities. Important events have centered on the topic, showing the increasing interest in annotations in the humanities disciplines. For instance, in the framework of DARIAH infrastructure, the "DARIAH-DE experts workshop on interoperable annotations for the arts and humanities" has been a significant event, focused on two aspects: (1) examining how more general scholarly annotation standards (as for instance those mentioned in Section 2.9) apply to the specific case of the humanities, and (2) on identifying typical annotation practices and the methodological use of annotations in the digital humanities ("Interoperable annotations for the arts and humanities, colloquium," 2013; Walkowski & Barker, 2014). "DH-CASE" and "DH-CASE II," collocated with ACM Document Engineer Conference (DocEng), are other examples of current events around annotations in the humanities. These are a series of workshops on collaborative annotations in shared environments, which have a more system ("tools") oriented perspective. In the framework of this humanities-oriented research, some studies with an information behavior focus take place (some examples are presented in Section 7.4.4.2.

AB.25. Cognitive aspects. Another research topic associated with the study of annotating practices is Piolat, Olive, and Kellogg, (2005), who evaluated the cognitive aspects in relation to mental load required during annotating activities. The authors found that note taking demands more effort than reading or learning, but less effort than creative writing composition of original texts.

AB.26. Attitudes towards sharing annotations. Personal factors in relation to attitudes toward sharing and shared annotations are investigated by Hemminger & TerMaat (2014). The authors found that "although scholars clearly support creating and using shared annotations, several socio-cognitive hurdles have hampered adoption of scholarly shared annotation systems." An earlier work in this line is Marshall and Brush' (2004) study mentioned above (AB.23).

AB.27. Theoretical and social aspects. A few publications, like Winget (2013), show interest in reflecting how participatory culture has brought significant transformations in document creation and circulation, and consequently to the role of libraries, archives, and museums in collecting and preserving. Questions about the "nature of the primary artifact" brought about by markup technologies are also the subject of reflection of Scifleet et al., (2009), and of some of the initiatives mentioned in AB.24.

3.4.3. Summary of annotating-related factors

The previous section presented representative research about information annotating-related behaviors in three broad areas identified in Section 2.9 (i.e., indexing, tagging, and annotating (glossing)). The term "behavior" is used with different meanings and scopes in those perspectives. A closer examination, however, shows similar aspects. The purpose of this section is to map those scattered topics, in order to identify the most relevant aspects for the study of information-annotating behavior in relation to *nichesourcing*. Table 3.2 groups those

topics by using the concept of "research dimension" (§3.6.1) proposed in the IS&R framework. These "mapped" elements, serve three purposes: (1) providing concepts and evidence for proposing an extension to the selected model for this research in order to adapt it to the study of information-annotating behavior (this will be done in Section 3.5); (2), serve as a guidance for selecting which topics should be investigated more in detail in relation to this thesis' research problem (this will be shown in Section 3.6.1); and (3), provide the "literature" support in the analysis process (this procedure is detailed in Section 4.7).

Hence, Table 3.2 shows in the third column from left to right the research aspect identified in the literature. The research dimension appears in the left column, followed by the research tradition in which the research topic originated. On the right side, the last column includes the code of the research aspect, which corresponds to the consecutive number assigned to it in Section 3.4.2, the cross-references can be found in these sections:

- AB1 to AB7: Indexing behavior (§3.4.2.1);
- AB8 to AB20: Tagging behavior (§3.4.2.2); and,
- AB21 to AB27: Annotating (scholarly) behavior (§3.4.2.3).

Table 3.2. Elements for the study of information-annotating behavior.

"Type of research area" corresponds to the IS&R framework (§3.6); "AB element No." refers to the sequential number presented in Section 3.4.2).

Research aspect (or dimension)	**Information -annotating related behavior**	**Information Annotation Research aspect**	**Scope**	**Example studies**	**AB No. (§3.4.2)**
General context related aspects	Indexing	Indexing (categorization) theory	Cognition studies; classification-theory; aboutness-theory	(Bowker and Star, 2000)	AB.6
	Tagging	Tagging domain	The application of tagging activities to specific domains or disciplines; the role of tags in scientific or scholarly communication	(Ådland and Lykke, 2012); (Gherab-Martín, 2011)	AB.12
	Tagging	Theoretical/Philosophical views	Implications and relation of tagging with broader social or theoretical issues	(Weibenger, 2008)	AB.20
	Annotative (scholarly)	Domain related aspects	Use and influence of annotating practices within a domain, discipline or activity, e.g., learning, music composition	(Winget, 2007)	AB.24
	Annotative (scholarly)	Theoretical and social aspects	Implications of annotating practices in communication, nature of documents, or role of memory institutions	Winget (2013)	AB.27
The organizational task dimension	Indexing	Environmental factors	Physical surroundings of the indexer, work patterns, collaborative work	(Albrechtsen, Mark Pejtersen, and Cleal, 2002);	AB.7
The actor dimension	Indexing	Personal factors	Related to the human indexer, such as age, sex, background, indexing experience, acquaintance with the system and users, motivation, interest, aptitude, and individual cognitive processes	(Saracevic, 1991)	AB.5
	Tagging	Perceptions and attitudes towards tagging	Attitudes towards socially generated tags	(Kim and Rieh; 2011)	AB.13
	Tagging	Familiarity with the source	Influence of past experience or knowledge of an information object	(Bar-Ilan et al., 2010)	AB.16

Type of research area	Information-annotating related behavior	Information Annotation Research aspect	Scope	Example studies	AB No. (§3.4.2)
The actor dimension (cont.)	Tagging	Familiarity with tagging	Experience with tagging systems	(Lee et al., 2009)	AB.15
	Tagging	Background knowledge and expertise level	Influence of domain expertise	(Dong and Fu, 2010)	AB.17
	Tagging	Motivations for tagging	One of the most important topics of tagging behavior research to date: why do people tag?	(Marlow et al., 2006)	AB.9
	Annotative (scholarly)	Annotating habits and motivations	Reasons for annotating; influence of digital technologies in traditional practices; reading and writing behavior	(X. Fu, Ciszek, Marchionini, & Solomon, 2005)	AB.22
	Annotative (scholarly)	Cognitive aspects	Mental load and cognitive processes during annotating	(Piolat, Olive, and Kellogg, 2005)	AB.25
	Annotative (scholarly)	Attitudes towards sharing annotations	Personal attitudes towards sharing personal annotations; how annotations change if a person knows they will be shared	(Marshall and Brush, 2004); (Hemminger & TerMaat, 2014)	AB.26
Actor dimension (interaction-oriented)	Tagging	Tagging process as a cognitive activity	Tagging as a mental, cognitive process; imitation effect; cognitive effort	(Sinha, 2005); (Phuong, 2011)	AB.14
	Tagging	Participation style	Type of participation depending on personal factors	(Körner et al., 2010)	AB.18
	Tagging	Tagging literacy	Is it possible to train people on how to tag?	(Moura, 2009); (Kim, 2013)	AB.19

Type of research area	Information-annotating related behavior	Information Annotation Research aspect	Scope	Example studies	AB No. (§3.4.2)
Document Dimension	Indexing	Document-related factors	Format, presentation, vocabulary, point of view, etc., of the document itself	(Pejtersen, 1994)	AB.4
	Tagging	Media-related factors	Application of tagging processes to specific media	(Golbeck et al., 2011)	AB.11
Document dimension (annotation outputs)	Indexing	Indexes (output) related factors	Indexing outputs quality evaluation; accuracy; consistency	(Soler-Monreal and Gil-Leiva, 2011)	AB.1
	Tagging	Tags (output)-related factors	tagging communities; user profiles based on tagging behavior; tag recommendation features	(Marvasti & Skillicorn, 2008)	AB.8
	Annotative (scholarly)	Types of scholarly annotations or annotation types	Different forms of annotations that people create (e.g., comments, highlighting or underlying marks)	(Hastreiter et al., 2013); (Madden et al., 2013)	AB.23
Algorithmic dimension[56]	Tagging	Tagging systems	How system functionality affects tagging behavior	(Heckner et al., 2008)	AB.10
	Annotative (scholarly)	Annotation functionality (tools)	Graphical user interfaces for annotating tools; human-computer interaction	(Decurtins, Norrie, & Signer, 2003)	AB.21
Access and interaction (Interaction processes while performing annotating activities)	Indexing	Procedural factors (indexing process)	Procedural factors related to the indexing system (e.g., KOS); methods, rules, and indexing as s decision-making process	(Smith and Kells; 2005)	AB.2
	Indexing	Indexing process (subject analysis)	Stages of the indexing process; determination of the document's "aboutness."	(Mai, 1999; Mai, 2000)	AB.3

[56] This dimension in the case of "indexing" is not reflected here, since this is the major field of research of the algoritmic dimension by default.

3.5. Information-annotating behavior in an IS&R framework[57]

This section describes how the concepts of annotation and information-annotating behavior proposed in Section 3.4.1 can be explained by the IS&R framework, by using the main basic elements of the integrated IS&R framework introduced before (§3.3.3, Figure 3.4), and informed by the concepts identified in the literature review presented in the previous section.

3.5.1. Annotating information in an IS&R framework

The original IS&R model covers a variety of human **actors** that participate in the IS&R process: authors, human indexers, designers of retrieval and communication interface functionalities, designers of retrieval engines and logics, selectors* deciding the public availability of objects, information seekers, and organized communities of individuals (p.260). Even though the main emphasis of the IS&R framework is on seeking and searching, it also contemplates other instances of information interactions in which the actors are also creators of information objects. The model explicitly refers to all these actors, except to the information seeker, as creators of information objects and their representations.

According to the principle of polyrepresentation, the information seeker is also originally regarded as a "contributor" to the IS&R process (as all the other types of actors are) "via their cognitive states." However, the information seeker does not seem to be considered as a contributor of annotations. This is logical, though, since the model was proposed in 2005, and the "social tagging" phenomena, in which the new perspective of having the "information seeker" as an annotator, became widespread approximately in that year (§1.1). Indeed, in an earlier publication, Ingwersen (1996) indicates that "during the actual act of retrieval the searchers of information basically play an interpretative role within this framework" (p.25).

However, because the principle of polyrepresentation, proposed already in 1992, indicated the benefits for IR of having several representations of the information objects and actors interacting during seeking and searching, the comprehensive view of annotation proposed in this chapter, which includes indexing, tagging, and annotating in a traditional sense (glossing) as similar phenomena seems to have been anticipated, and deserves to be considered in this framework.

An additional argument in favor of regarding the information-annotating phenomena in light of the IS&R framework and the polyrepresentation principle, is that Ingwersen and Järvelin clarify that "cognitive" signifies emotional or affective perceptions and structures (p.259), and that in the most recent perceptions of the holistic cognitive viewpoint (from the 1990's):

> "all actors participating in IS&R are viewed as contributors in the process via their cognitive states as represented by information objects, database structures,

[57] "Quotations in this section –otherwise stated- come from Ingwersen & Järvelin (2005), also referred occasionally with the book's title as "The Turn", only the page number is added in those cases.

> indexing structures and retrieval algorithms, interface designs, human work task perceptions and request representations, etc. Each representation is regarded as situated in a context, predominantly of social, cultural or emotional nature" (p.16).

This "human" view of IS&R is open to the UGC phenomena, in wich actors are contributing to these processes with a higher degree of emotional and participative involvement. Thus, in this inclusive perspective of information-annotating behaviors as part of an IS&R process, all actors are considered as "generators of signs that hold potential information" (p.266), and all the actors mentioned above may potentially play the role of annotators during information seeking or searching. The result of their "creations" is called "**Information objects**" in the original model.

In relation to the "document space," Ingwersen and Järvelin suggest that document representations are a kind of information object (the underlining is mine):

> "As part of generating information objects the actor may thus *acknowledge* or recognize the intellectual and/or emotional impact of his/her situation at hand, made by other contextual sources –for instance by the peer community. Depending on the available IT the author may be able to *point* to useful sources by means of, for instance, scholarly references, acknowledgments, or navigational Web outlinks. The pointers form part of the generated object, but are also representative of the objects pointed to. They act as document features and are examples of *situational relevance* representations, on the side of the author" (p.266).

In the original IS&R model, information objects are cognitive manifestations that are produced during the cognitive actors' activities. As it is assumed in this thesis, annotating information is one of those activities, which happens in parallel to document creation, retrieval, or use. Hence, according to the previous quote, it would be possible to argue that annotations, which are created before, during or after the (central) information objects are retrieved or made available for use or reading, are also information objects in themselves.

Thus, it is proposed to consider the outputs of information-annotating activities as belonging to the document space, represented as a "layer" (using Agosti's 2005 term), that would be an extra dimension to the information objects component in the original model in Figure 3.4. That layer, shown in Figure 3.8, is in essence of a (poly)representational nature. The appropriate term for naming it would be a "polyrepresentation(s) continuum," since it would denote the interrelated nature of both annotations to information objects, and between the representations embedded in the information objects and between information objects themselves. However, the term "polyrepresentation continuum" has already been used by Larsen (2004), to refer to the implementation of polyrepresentation between structured or unstructured poles according to IR principles and retrieval logics. Thus, the "continuum" is named here according to the meaning of the term annotation proposed in this chapter, and represented in the figure as an aura-like circle around information objects. The types of "objects" in the extra layer would be, for example, notes or comments (in the traditional meaning of annotation as glossing), keywords*, tags*, indexing terms (e.g., descriptors, subject headings, or index entries), or even more broadly, any derivative object or document

that extends, explains, summarizes or complements in any form the initial object being annotated. In this view, annotating is ubiquitous, happens in any information related task, and can be performed by different actors, which assume the role of annotators at any time (even if they are indexers, authors, selectors*, readers, or users/seekers). Finally, in this perspective, an annotation can be in turn annotated. Indeed, "annotation types can also include additional features, such as giving the user the possibility to reply on annotations created by other users or to relate digital items by means of annotations" (Haslhofer et al., 2009, p.21).

In the sense described above, the terms "annotations" and "polyrepresentation(s)" could be regarded as synonyms, although the latter one also refers to embedded representations within information objects (e.g., a table of contents provided by one author), and the former one includes user (information-seeker)-generated tags, which was not explicitly included as an example of (poly)representation, due to the reasons commented at the beginning of this section.

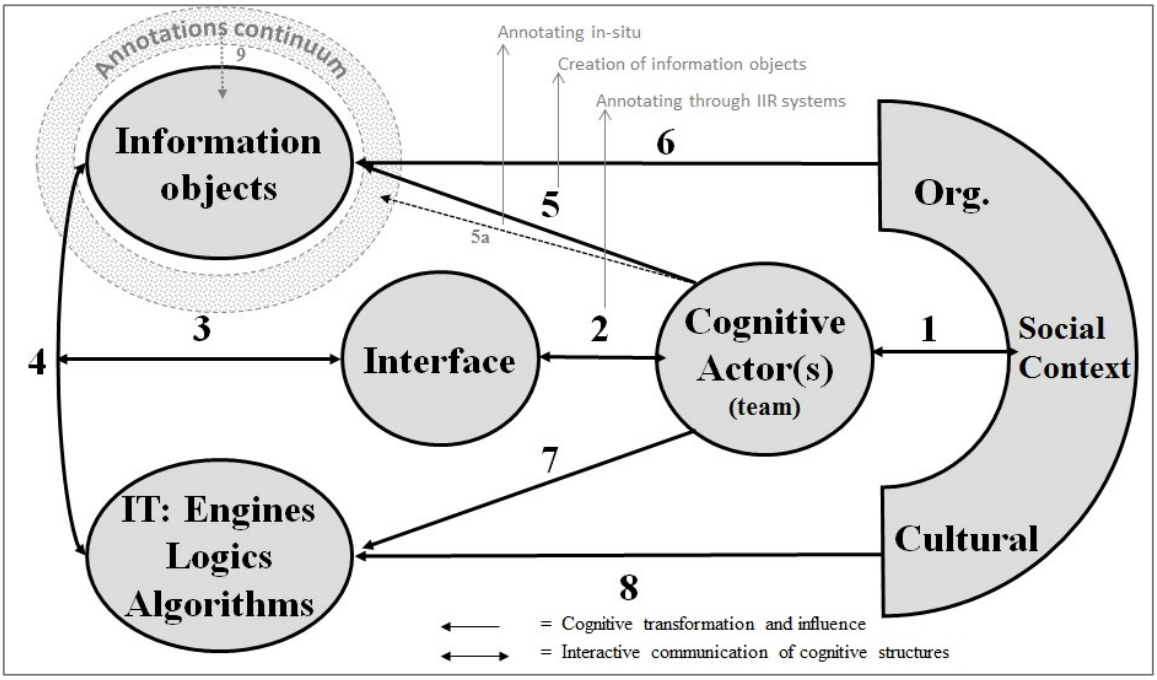


Figure 3.8. Information-annotating in the integrated IS&R framework.

Adaptation with permission by this thesis' author (added elements in light gray) of Ingwersen & Järvelin (2005) "Interactive Information Seeking, Retrieval and Behavioral processes. Generalized model of any participating cognitive actor(s) in context" (p.261).

The annotations continuum proposed in Figure 3.8 echoes the concept of "multivalent" documents by Phelps and Wilensky's (1996), in which a document is composed of layers and behaviors, and the call that Winget (2013) makes for considering interactions as one of the forms of obtaining annotations that enhance access to documents and content. It also agrees with the broad definition of annotation presented by the W3C (§3.4.1). Furthermore, in relation to the status of personal annotations in the current online and shared environment

information landscape, Haslhofer (2009) comments:

> "The question whether annotations are content, metadata, or even dialogue acts has often been discussed within and between communities […]. In the context of our work, however, we consider them as metadata and rely on interoperability strategies that have been developed for solving problems connected with metadata heterogeneities" (p17).

According to the polyrepresentation principle, the annotations-(information objects) continuum and the embedded implicit or explicit representations within them, could be regarded as a form of "metadata" in the sense proposed by Haslhofer (2009) and Agosti et al., (2005) (metadata, in this case, is understood in its broader sense (according to the second meaning of the term proposed in Section 2.2.1). In an IS&R perspective, they could naturally be seen as "metadata," since they are representations with different cognitive origins, created from information interactions, which could be "exploited" through IIR mechanisms according to the polyrepresentation principle.

An additional part of the extension to the original IS&R framework represented in Figure 3.8 is arrow 5a. The creation of information objects, as explained by Ingwersen & Järvelin, happens "when the author or (co-authors) transforms her/their interpretation of the world directly into a message of signs, for instance, a spoken or written one" (p.264). In the original IS&R model (Figure 3.4), arrow 5 refers both to the creation of information objects as to human indexing activities. As proposed in the adapted model (Figure 3.8), one may see the creation process fluctuating between two extremes: on one side the action of proper work creation (arrow 5), e.g. writing a novel or scientific paper, or a student essay; and on the other extreme, the annotation act, which may be for instance the simple interaction of highlighting a printed text (arrow 5a). Hence, arrow 5a indicates the forms of creating annotations in-situ[58] (as a complement to the information creation process indicated by arrow 5 in the original model), while arrow 2 indicates the forms of creating annotations through interfaces (via an underlying information system, arrow 4).

The typology of annotation motivations already developed by the W3C Open Annotation Community Group could be used to describe this interaction (arrow 2) and cognitive influence (arrow 5a) more in detail. This typology is proposed as part of the W3C "open annotation data model," in the form of SKOS concepts. The high-level list of instances of the "motivation" concept, with their corresponding descriptions, includes: bookmarking, classifying, commenting, describing, editing, highlighting, identifying, linking, moderating, questioning, replying, and tagging (Sanderson et al., 2013b). It is interesting to observe that indexing and cataloging, as forms of information annotating interactions performed by information professionals, are not part of this taxonomy. However, assuming a broad concept of annotation as proposed in Section 3.4.1, indexing is also one type of cognitive transformation (arrow 5a) and information annotating interaction (arrow 2) that may influence the

[58] This term comes from a power point presentation (not published) by Prof. Peter Ingwersen (2011), in which he shows "in-situ tagging" and "in-situ recommendation" as part of the IS&R framework.

findability* or perception of the annotated information objects (arrow 9).

Indeed, an extra addition to the original model is arrow 9. This is to represent that an annotation may create a kind of "embedded" cognitive transformation and influence in an (original) information object as a result of the interactions that occur between information objects and people (which are magnified in social web environments). For instance, an annotation in-situ made "within the document" (arrow 5a) may influence its understanding by a reader as, for example, in the case of library books that have been "annotated" by other readers embedding their personal views of what they find relevant for comprehension, thus influencing the next reader. It can also be the case that the annotations change an existing information object itself when they are made through interfaces that allow "editing" (arrow 2)[59]. This is actually an issue brought about by digital technologies and UGC phenomena. Furthermore, in certain cases, "stand alone" annotations also become part of the information objects main space, when they are sought as independent entities, for example, the case of valuable annotations kept for personal use by the authors themselves, which become published (as in the case of manuscripts, or in the example of the "commonplace book" kept by John Locke, cited in Winget (2013), or the class' notes that are published online by students' groups). Other forms of interactions, such as "commenting", "questioning" or "moderating" are of a different kind, which will be discussed more in detail in Chapter 6 (§6.6). In future research, there are several possibilities that open up for integrating other models of annotating interactions. For example, Bloom's taxonomy of learning in action (Krathwohl, 2002), shows how certain annotation practices are associated to different learning processes (for example, "understanding" requires, for instance, classifying or summarizing).

The concept proposed by Agosti et al. (2005) of "embedded usages" fits in this **interactive** view of annotation, since it conveys the idea that: "access to content is not seen as an isolated activity, but as part of a larger work process, where interaction with other users, editing and annotating documents need to be integrated". Moreover, having people actively performing the role of indexers (annotators) in shared environments creates a new dimension to the relationship between actors and information objects, which is the **motivation** for the annotation, for instance, professional, voluntary, passive, or other reasons that drive each person to contribute (§§3.4.2.2; 3.4.2.3). Thus, in that sense, the annotations' space is determined by motivations and personal factors of the cognitive actor. One important motivational factor from an information retrieval perspective could be named as **IR stewardship**, based on the original dimensions proposed by Furner, 2009 (shown in Table 2.1). As it was commented before (§2.9), it is not possible to establish a clear connection between a certain group or annotation perspective and the types of annotation outputs that are created (for example, there may be information professionals creating tags, but there are

[59] Indeed, Ingwersen & Järvelin also explain that "an actor may also interact horizontally with a data entry interface to a system in order to generate information objects" (p.265). In the adapted illustration, annotations in the aura-like part of the information objects space.

also non-indexing professionals who know how to pick up a descriptor). The idea that "tagging is a voluntary act of query" (Prof. E. Méndez, personal communication, 2012) may apply only to certain cases, for instance when there is an underlying classifying or describing motivation for the annotation.

Hence, IR stewardship means the interest and abilities that a person, the final annotator, has in performing the annotating activity with the purpose of facilitating future retrieval, either for personal use or for being used by others. A higher level of IR stewardship is not exclusive to information professionals. In the current digital landscape, it is even more common that different groups of people are more interested in gaining abilities in indexing, cataloging, or (algorithmic) programming. Even more, there may be different types of IR stewardship or skills related to information organization, for instance, Körner, and Kern, (2012) identified differences between "classifiers" and "describers." Other distinctions at this level may come, for instance, from Marshall's distinction between *implicit* and *explicit* annotations. While an explicit annotation allows others to interpret it and is therefore also intended for sharing, implicit annotations are often only interpretable by and useable for the original annotator. In the audiovisual domain, talking about the specific case of YouTube, Kessler and Schäfer (2009, p. 285) similarly propose two categories of interaction: "explicit interaction", and "implicit interaction." In the first category fall the "acts of deliberate participation" (e.g., uploading, tagging, commenting, flagging), while in the second category are the traces in the system that every user leaves while navigating the online system.

An additional aspect of the influence that the annotations-continuum space has in the entire information seeking and retrieval processes is when annotations are converted into more sophisticated IR objects, for instance, a folksonomy converted into a taxonomy through tag quality control mechanisms. These structures can become information objects themselves (e.g., a thesaurus), but they can also be embedded in the IT component and subsequently support the interaction process (arrow 3) that takes place during annotating information (e.g., through guided tagging) via interfaces (arrow 2). Thus, this IR stewardship motivation does not only belongs to a person but could also be incorporated into information systems that enable annotation depending on the willingness of information system designers to allow for such participation (arrow 7). One form of interaction enabled by these representations is, for instance, the feature of providing guidance in the annotating process (as in the "Your Painters tagger"$^{(rw)}$), or the option to share an annotation using underlying interoperability standards.

It can also happen that a person has a high level of IR stewardship, but the **interface** and **IT components** are not prepared to provide support in the annotating interaction. An example is the case of a person who classifies different recycling materials at home (a high level of classification stewardship), but when going to the garbage bins only finds one bin for all types. In the IS&R framework, the IT component and its algorithmic dimension cover basically three aspects: (1) the knowledge of how to represent documents which is embedded in the

algorithms that process them for indexing[60]; (2) the tools themselves and the structures that support query formulation and matching (and annotation in this case); and (3) the interface and visualization tools (p. 317). The first dimension corresponds to the aforementioned "IR stewardship level", and also to the degree of indexing or annotating expertise of the actor (according to the elements identified for the study of annotating behavior in §3.4.2); the second dimension would correspond to the mechanisms that allow the integration of user-generated annotations to become part of the information objects themselves (through editing), or to the indexing infrastructure (e.g., by adding a term to a thesaurus that is used to support annotation). The third dimension above corresponds to the interface for the annotation, the features associated with different "scaffolding" levels.

Finally, in this exploration of the IS&R perspective of annotation, ***the socio-organizational context*** is a key component to explore, since it is one of the main components of the IS&R framework, which makes it a model more comprehensive and realistic in scope than other IR models. Since the center of the model is the cognitive actor, context is indeed a determinant factor of any information-related activity. The component includes, as the authors indicate, the social, organizational and cultural context of the information seeker, which corresponds to its environment, in the form of scientific or professional communities, as well as socio-cultural domains (p.276). Within the proposal to explain information-annotating behavior through the IS&R model, context would be determinant at several levels, but the most immediate one would be organizational and project related.

One of the few studies about *crowdsoucing* projects (Noordegraaf et al., 2014) studied the organizational factors for failure or success of these initiatives driven by cultural institutions, more specifically in two cases applied to photo-tagging in an archival context: "Red een Portret"(rw) (Save a Portrait) of the Amsterdam City Archives and a photo-tagging project of the Maria Austria Institute on the "Vele Handen"(rw) (Many Hands) *crowdsoucing* platform. The investigation concluded that there are six "pillars" that can help project managers to state better the goals of *crowdsoucing* projects. The "six pillars" identified by these authors are shown in Figure 3.9[61].

[60] "'The IR system setting' consists of implemented structures, e.g. IR technique and indexing rules, representing the designers' conceptions of how to process the objects in the system" (Ingwersen, 1992, p.17).

[61] In practice, as in any other information-related project, planning, and strategy, as wells ethical issues are fundamental. Even though this thesis has not investigated organizational issues in detail, current research in the field of "cultural heritage *crowdsoucing*" (Ridge, 2014), about the factors of failure or success (Noordegraaf, Bartholomew, Eveleigh, Proctor, & Cherry, 2014), are easily applied to, and somehow overlap with, *nichesourcing* projects. Other relevant recent investigations about project management in this area include for instance, Dombrowski et al., (2014), in relation to the Bamboo project, and Voss et al., (2015).

Institution	Collection	Goal	Crowd	Infrastructure	Evaluation
Institution Type	Medium	Beneficiaries	Characteristics	Complexity of Task	Qualitative Measures
Culture of Digitization	Size	Task Type	Training	Evolution of Task	Quantitative Measures
Budget	Complexity	Timeframe	Attracting Participation	Level of Scaffolding	Incorporation of project results into collection
Intellectual Property Rights	Appeal	Accuracy	Sustaining Participation	Generic Platform or Devoted Project Site?	Incorporation of project findings into workflow

Figure 3.9. "The six pillars of the [crowdsoucing] model" (Noordegraaf et al., 2004)

Given the fact that investigations in the area of *cultural heritage crowdsoucing*, and even less in *nichesourcing* applied to the audiovisual domain are just emerging, finding a correspondence between the IS&R perspective with the outcomes of this study is necessary. In what concerns the organizational context in the IS&R framework, the most determinant pillars are "institution" and "goal". From the identified pillars, one can see which elements can influence information annotating activities in the context of *crowdsoucing* or *nichesourcing* initiatives, such as the type of organization, digitization policies or culture, or budgetary or intellectual property rights issues. These elements are more related to (digital) access issues to a collection of information objects. The "beneficiaries" in the "goal" pillar correspond to the "utility community" in Ingwersen and Järvelin's terms (p.264), which is the selected group for which an information system design or information object creation is intended.

The "task type" in the "goal" pillar, and some elements of the "infrastructure" pillar (i.e., the "complexity of task" and "evolution of task") are more closely related to the information actor's cognitive space, and could have a more evident impact in the annotating interaction. As it was commented above, the IR stewardship levels that are "embedded" in the information systems used for the annotating activities would certainly influence the level of complexity of a given task, and would also determine the "level of scaffolding" identified as one of the elements in the "infrastructure" pillar.

Finally, an important pillar proposed by Noordegraaf et al. is "evaluation." In a *crowdsoucing*/*nichesourcing* setting, establishing quality and quantity measures is determinant, but even more, being able to incorporate the annotations (project results) into an existing collection and metadata "workflow." In an IS&R perspective of this phenomena, this would correspond to transformations and generation of potential information as required by the social, cultural or organizational context towards the IT and information object components over time (arrows 6 and 8). This is of importance, because a lack of interactive communication of cognitive structures over time that result in transformations to the interfaces, may make these become "isolated". As Ingwersen and Järvelin indicate, an

"isolated interface may fast become obsolete if not capable of learning about novel characteristics of objects, IT, searchers and retrieval models" (p.270). It may also be the case that the annotating functionalities are (or should be) in constant transformation and interrelation through dynamic feedback. This is an essential component of the cognitive viewpoint which, as Ingwersen (1992, p.17) explains, represents a subjective and profoundly dynamic style of information processing, ideally resulting in continuous changes of models and the actual state of knowledge for each [actor] and information processing system.

The previous description of information annotation as seen in the perspective of the IS&R model indicates that *crowdsoucing*/*nichesourcing* initiatives, within the scope proposed in this thesis (§1.2), involve phenomena that are not trivial for IS&R processes, and even less, for the functioning of cultural heritage institutions as systems of information organization and curation*.

Next, each of the identified information-annotating behaviors in Section 3.4.2 is described in light of the adapted IS&R framework and the concept of annotation in this perspective that was presented in this section.

3.5.2. Indexing behavior in an IS&R framework

Using the extended IS&R framework presented in Figure 3.8, one of the identified types of information-annotating behavior, namely indexing, could be represented as in Figure 3.10.

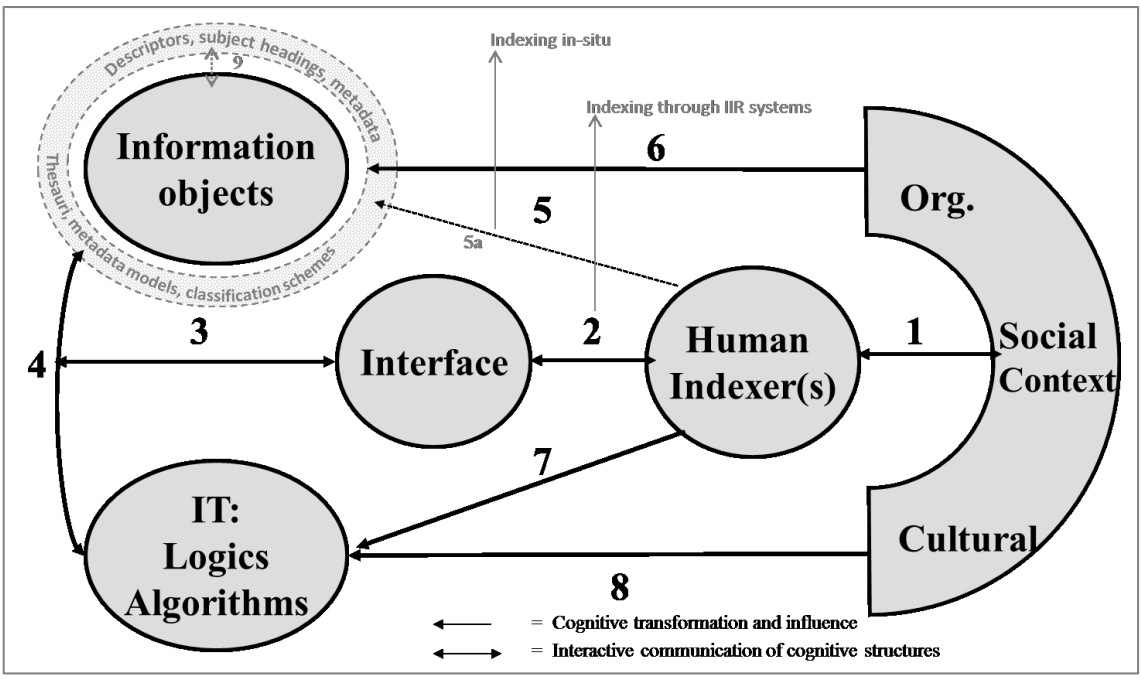


Figure 3.10. Human Indexing in the IS&R framework.

Adaptation with permission by this thesis' author (added elements in light gray) of Ingwersen & Järvelin (2005) "Interactive Information Seeking, Retrieval and Behavioral processes. Generalized model of any participating cognitive actor(s) in context."

In order to explain this figure, it is important to consider that in the case of human indexing behavior there are at least two broad categories of activities that take place: (1) the human act of indexing performed by a human indexer or cataloguer during her/his everyday work as an information professional, and (2) the coordinating role of creating norms, policies and standards at an organizational or international level:

In the first case (Figure 3.10), the indexer is also a "user" or seeker of information about the objects to describe at hand[62]. The indexer may interact with cataloging/indexing interfaces (arrow 2) for the purpose of searching information about the information objects, but mostly with the indexing interfaces which are connected to complex database architectures where the underlying apparatus, the IT component, is designed to make retrieval possible in the future (arrow 4). This actor performs the annotating activity with a high level of consciousness and knowledge about these underlying infrastructures (i.e., a high level of IR stewardship). This is added to her knowledge of organizational, cultural, and social context, in which the potential user (i.e., "utility community" or "utility context" –p.267) of the annotations and/or information objects exist, and where retrieval takes place (arrow 1). The result of this annotation process, the indexing outputs, are the professional annotations, which assume the form of descriptors or subject headings extracted from controlled vocabularies.

In the second case above, the indexers, together with other professionals, design the logics that underlie indexing in practice, influenced by the organizational, social and cultural context over time (arrow 8), which they also influence through social interaction (arrow 1) in the form of dissemination activities. These teams have created infrastructures such as MARC, which are a kind of information object as well, as thesauri and the like also are. These information objects (thesauri, classification schemes -such as Dewey or UDC-, or cataloging rules -such as RDA) are of a special type since they "can be seen as a result of collective cognitive structures or socio-cognitive conceptual assessments of domain phenomena and document structures" (p.266). They may be embedded in the IT component (arrow 7) to facilitate information interaction with the purpose of annotating/indexing, for instance when they become the underlying logics. This happens, for example, when an OPAC incorporates a thesaurus as part of the cataloging interface, or adapts its implicit rules to a data model or standard (e.g., to Dublin Core). Current efforts in developing IT systems to support indexing are focused on embedding mechanisms to facilitate interoperability of the indexing outputs with the global World Wide Web architecture (for instance as described in Section 2.9). The main cognitive manifestation of the designers of indexing structures at this level (arrow 7) corresponds to their underlying annotation models and languages (for instance RDF), which represent worldviews on how knowledge and information can be modeled.

[62] For example, in the case of indexing fiction, Pejtersen (1994, p. 261) suggests that reviews should be used as a source of information for the "skimming" part of the subject analysis. Seeking is certainly a necessary process as part of getting familiar with the source to be described, and an important behavior to be studied (i.e., information seeking for indexing purposes).

The most important aspect of the human indexing process (which makes "indexing" a unique type of annotation) is its intentionality in relation to retrieval (the IR stewardship level suggested before). In the cognitive view, awareness of the "utility community" (arrow 1) is a key element, and it may be one of the differentiating elements of human indexing with other forms of non-professional annotations, or with automatic annotation. Indeed, even when it is performed by humans, indexing can potentially be a "system-oriented" activity if it does not take into account the potential users of the information objects or annotations. As Ingwersen and Järvelin (2005) comment:

> "Intellectual indexing involves human indexers, but may be most often considered nevertheless systems-oriented – the indexers and the indexing language being part of the system and indexing aiming at serving no narrowly defined user group" (p.132).

Another component that makes this a unique type of annotation is the subject analysis phase. This phase can be done manually or automatically. Indeed, there are algorithms that can extract subject terms based on terms occurrence, but the intention of capturing the "aboutness" is the same in both cases. This intentionality may also be a differentiating characteristic of "indexing" from annotating (glossing), or from tagging (since not all tags are "aboutness" tags).

Perhaps the most clear example of a practical application of the study of indexing behavior in an IS&R perspective is the area of work domain analysis (Pejtersen, 1994), or "cognitive work analysis" (CWA) (developed by Rasmussen, Pejtersen, and Goodstein, 1994, as cited by Fidel, 2012), which consists of designing information systems by taking into account task decisions, strategies, profiles of individual users (actors) in a given work domain, including their mental models and roles in work settings (organizational context).

3.5.3. Tagging behavior in an IS&R framework

Social tagging has been defined as a way of organizing information by novices as opposed to the way indexing experts do (Peters, 2009, p. 1). One of the key factors in the success of social tagging in engaging different types of people is the reduction of intermediary steps followed in traditional indexing practices, saving them from the need for first thinking on a concept and then representing it through the correct term from a controlled vocabulary (Halpin, Robu, & Shepherd, 2007). Moreover, since tagging belongs to what Hjörland (2010) calls the "subjective pole of indexing theory", the creation of tags is most of the time unaware of retrieval and lacks intentionality in that respect (that is, the level of IR stewardship of the cognitive actor may be assumed to be rather low by default).

Observed in that way, tagging is indeed a simplified version of indexing as a form of annotation, but also a more complex version of the interaction that takes place. It is proposed to be represented in an IS&R framework as in Figure 3.11.

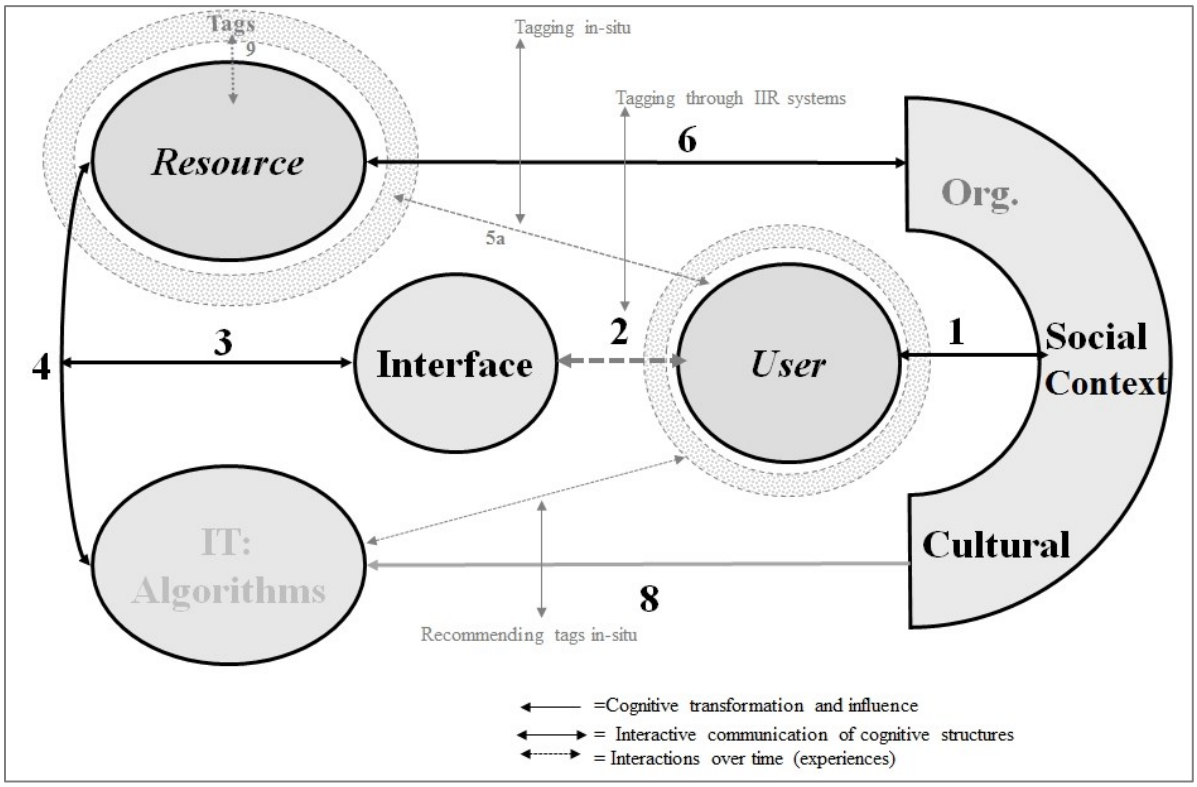


Figure 3.11. Tagging behavior in the IS&R framework.

Adaptation by this thesis' author with permission of Ingwersen & Järvelin (2005) "Interactive Information Seeking, Retrieval and Behavioral processes. Generalized model of any participating cognitive actor(s) in context." Changed terms in italics, added arrows and circles in gray, elements in light gray are less influential)

Figure 3.11 updates the simple model of the tagging process, as it is commonly represented in the social tagging literature (Figure 3.3). In that model, there is a tripartite connection between users, resources, and tags. The connections between those three components, as explained by Wu and Zhou (2009), include: (a) user to resources (i.e., tags allow to connect an actor with information objects and their derivatives depending on how the resources were tagged by the same or other users); (b) tag to resources (many sources are connected through common tags); and (c) user to users (users are linked through collaborative tagging).

In the adapted IS&R model, the component "actor" has been changed to "user", since most tagging systems to date consider people (actors) as contributors with their tags. Also, the relation between users and resources through tags (a), is represented by arrow 5a, an annotation act in which another information object, a tag, is created in-situ (or through an underlying IT mechanism and interface, arrow 2), and connected to an information object being tagged (arrow 9)[63]. Arrow 9 corresponds to the relation tag to resources (b) in Wu and Zhou. Similarly to the previous case, when tags are created through an interface, there may

[63] The term "in-situ" and part of this representation is derived from observing a power point presentation (not published) by Prof. Peter Ingwersen (2011), in which he shows "in-situ tagging" and "in-situ recommendation" as part of the IS&R framework.

be an underlying IT infrastructure that processes those tags for transforming them a posteriori into controlled keywords, in that sense, the connection between tags and resources (b) can become a "permanent" representation of the information objects allowed into a system. Also, even though offering the option to use thesauri or other controlled vocabularies to select the tags is unlikely (since it takes away the informality in tagging), automatic tag recommendation systems that suggest tags entered by other users are becoming common (see also guided tagging, §5.3.4). This happens through recommendation "in-situ" (arrow 7, transformed to become an interaction over time).

There are different ways of representing the relation between information seekers (users to users: "c", in Wuand Zhou proposal) from an IS&R framework. In this case, this connection is represented by another "aura-like" sphere around the actor's component (i.e., "user" in Figure 3.11). Also, arrow 2, now more prominent, represents a more complex interaction between user and interface, in which the systemic context (represented through the interface), and the social context (arrow 1) may become intertwined in a closer and interconnected influential interaction over the "user" in time. This happens because of the social transformations generated as part of the pervasive use of information systems in all social and personal situations.

3.5.4. Annotating (glossing) behavior in an IS&R framework

Figure 3.12 represents the scholarly annotating (glossing) behavior in an extended IS&R framework.

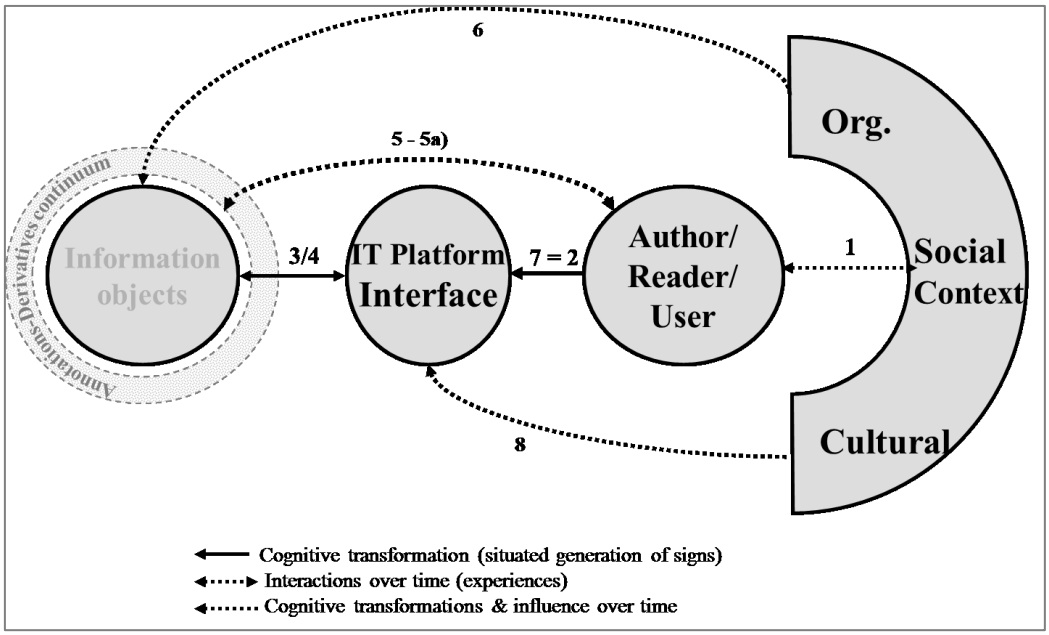


Figure 3.12. Scholarly annotating (glossing) behavior in the IS&R framework.

Adaptation by this thesis' author with permission (added elements in light grey) of Ingwersen & Järvelin (2005) "Interactive Information Seeking, Retrieval and Behavioral processes. Generalized model of any participating cognitive actor(s) in context."

Annotative behaviors in the traditional sense of the term, such as highlighting or note-taking, can be done on paper or in an online environment. In the second case, they can be supported by the IT component. However, as scholarly annotating activities do not necessarily have a high IR stewardship level, there is no predefined indexing setup, and the actor is not consciously performing the annotating activity for the purpose of future retrieval, nor is (s)he constraint to select a specific form of annotation, such as tags. This is perhaps the type of annotation in which the actor has the lowest level of retrieval intentionality in advance for other people.

In this case, the interface may be an integral part of the IT structure (for instance, when the annotation is done on paper). In this "stand-alone" annotation system, the actor (author, reader or user –as named in the circle), has direct interactive access to the information objects, their derivatives, and annotations. The actor is in control of both the information object (e.g. a book) and the technology to annotate it (e.g. a color pen), with no control or intermediary steps. The interactive processes between the information objects and the interface (arrows 3 and 4) become the same if there is no manipulation of the information objects. That is, in annotating (glossing) process mediated by an information processing system, the information objects may be transformed as a result of the annotation (e.g., by editing a transcription), and thus the interface becomes the means of transforming the information objects. In most cases, annotations done to information objects by other people different to their creators in online systems is not possible. Indeed, annotating tools are designed in such a way that the annotation becomes a layer superposed to the "original" object without altering it (e.g., Agosti et al., 2005). The most common situation is, for instance, is to add a "commenting" functionality, where people can "annotate" all kinds of web objects and documents in relation to what they are about, or discuss other topics "around" them.

Arrow 4 may not exist if the IT component is not built with a retrieval purpose in advance, i.e., if the (poly)representational nature of annotations is not "exploited" by an IR system. This happens in the case of annotation tools that are not interoperable and/or that not allow to process the annotations and use them for retrieval. In this case, other annotations may exist for the same information objects that an actor is annotating, but they are not accessible at the moment that the user annotates, or the annotator is not aware of this if the other creators have not made public their own creations/annotations. Finally, the extended model facilitates the representation of the socio-contextual influence in the annotation technologies (IT), which nowadays are starting to be transformed due to the influence of the social context that demands the creation of IT infrastructures to support this scholarly practice (e.g., the context of big data, Linked Open Data, and the Semantic Web).

This section has attempted to show one possible interpretation of the information-annotating phenomena as a concept and as an information-behavior from the IS&R perspective. The next section describes how the IS&R framework can be used for the guiding the study of information-annotating behavior applied to moving images.

3.6. Use, scope and limitations and of the theoretical framework

This section describes which elements should be potentially considered for the study of information-annotating behavior in an IS&R framework based on the aspects identified in the literature review (Table 3.3), and the proposed adaptations to the original model proposed in the previous section. The elements identified in this section are used for this thesis research design.

3.6.1. Use of the model in this thesis' research design

The IS&R model also includes a research program for IS&R (Ingwersen & Järvelin, 2005, p. 313-376). Figure 3.13 shows the variables of IS&R research, having the information seeker as the center.

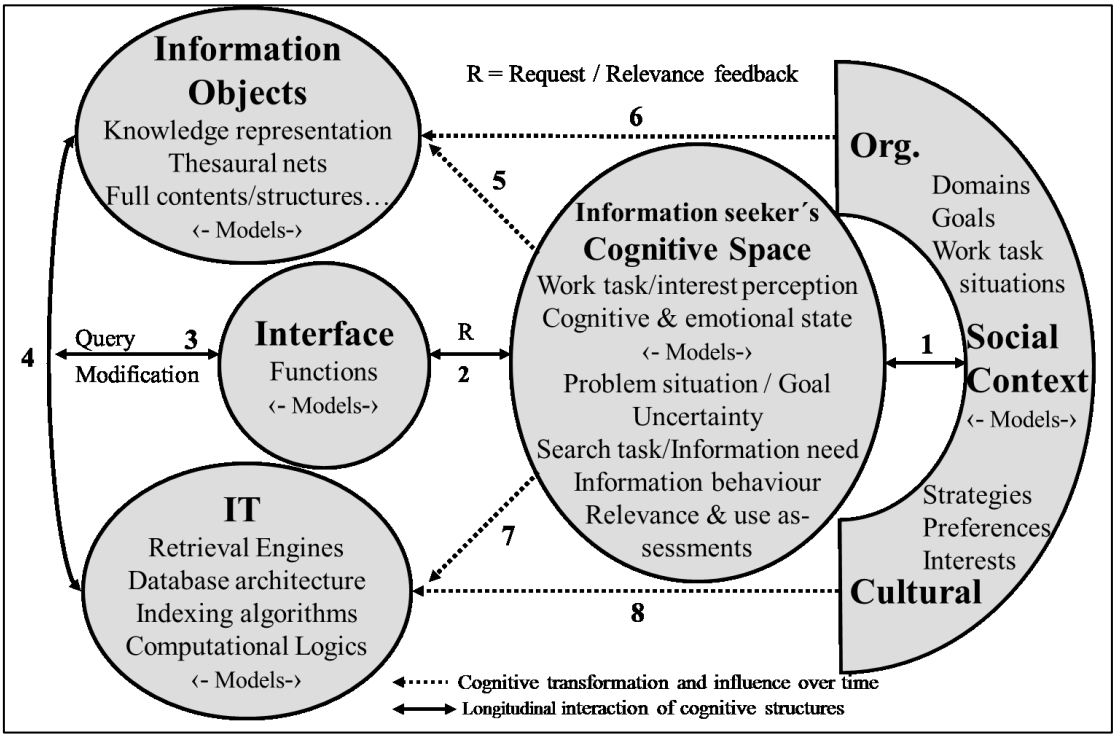


Figure 3.13. Cognitive framework of interactive information seeking, retrieval, and behavioral processes *(Ingwersen & Järvelin, 2005, p.274).*

There are nine research dimensions that constitute IS&R research design, each containing a range of variables. They are derived from the five categories that compose the IS&R model (§3.3.3) (definitions are from Ingwersen & Järvelin, 2005, p.313-314), and the most important elements of research related to information-annotating behavior are added in italics:

1. The Organizational Task Dimensions

i. Natural Work Tasks and Organization of work and system environment
ii. Natural Search Tasks; i.e., seeking and retrieval tasks, as understood in the organization. *Also annotating-tasks.*

2. The Actor Dimensions

iii. Actor (declarative knowledge and procedural skills)

iv. Perceived Work Tasks (the actor's perception of the work task)

v. Perceived Search Tasks (the actor's perception of the search task including information need types regarding the task and the task performance process; emotions)

3. The Document Dimension

vi. Document and Source types (document genres and collections in various languages and media)

The "annotations continuum" dimension: types of annotations and levels of connection with the information objects being annotated.

4. The Algorithmic Dimension

vii. IR Engines, IT Component (the representations of documents/information and information needs; tools and support for query formulation; matching methods).

viii. IR engines that support annotation (polyrepresentation(s)) by the information seeker or collaborative annotation (and moderation) in teams.

IR Interfaces (tools for visualization and presentation)

5. The Access and Interaction Dimension

ix. Access and Interaction (strategies of information access, interaction between the actor and the interface (both in social and in system contexts)

Interfaces that adapt to information-annotating tasks.

Although the framework suggests "empirical variables" that can be derived from these dimensions and applied to the study and evaluation of IIR systems* (including experimentation), the research presented in this thesis is done at an exploratory level in which, instead of hypotheses to be tested, there are research questions to be interpreted (§4.2).

The main focus of this thesis relies on the third dimension: the actors, who are the center of this study, and on the "annotations continuum" that belongs to the document space. This thesis investigation of annotation types and behaviors (§1.2) zooms into the added part to the original model in Figure 3.8, trying to identify how this continuum would be in the case of moving images.

In relation to the "cognitive viewpoint" described before, the actors present different world models and knowledge structures (Ingwersen, 1992, p.18) that could potentially be investigated in relation to the information-annotating activity. However, this thesis focuses only in one dimension of the actors' cognitive characteristics, which is **expertise**. Indeed, as Chapter 2 and this chapter have illustrated, there are different factors involved in determining the behavioral aspects of the annotation process. This thesis chooses to focus both on indexing and domain expertise since the focus of the study is the *nichesourcing* initiative, which bases its proposal in the contribution of domain experts to the indexing (annotating) process.

In this regard, it was previously commented that any actor can potentially play the role of annotator, and in spite of the fact that there are several potential actors to focus on, this thesis focuses on the following three types of actors (in their own roles and as annotators):

(1) Domain experts; in this case in the film and media scholars,
(2) Domain novices –also called "lay users," "casual users," or "general users" (they may be experts in other domains, but the focus in this thesis is on expertise in the film and media domain), and
(3) Indexing experts, also called professional indexers;

Table 3.3 summarizes the main "variables" investigated in this thesis' case studies: the selected actors' annotation activities (and information needs) are analyzed in relation to their work and search tasks (variables 1, 2, 4 and 5), also in connection with a specific document type (variable 6) (which are audiovisual information objects, more specifically of the type motion pictures (movies)). Variables 7 to 9 are of less importance in this thesis, although Chapter 2 broadly indicated the state of the art in moving images representation and processing systems. Likewise, one of this thesis' aims is to contribute to drawing conclusions that can enhance the design of information processing systems and interfaces (variables 7 and 8), and thus contribute to better access and interaction (variable 9).

Finally, to guide this thesis' research design, the literature reviews carried out for building the theoretical framework described in this chapter also served in the design of the data collection instruments, since most of the elements found in this review were included in the interview protocols. During the analysis procedures, those elements were also considered as emerging codes.

Table 3.3. Summary of main research dimensions from the IS&R model applied to information-annotating behavior research.

(The numbers in parenthesis correspond to the research variables/dimensions)

Annotation behavior type	**Study**	**Actor's expertise (3) + Access and interaction (9)**	**Natural work tasks (1)**	**Context**	**Document and source types (6)**	**Annotations (the output: metadata) (6)**	**Research factors** (from Table 3.2)[64]
Tagging behavior	A	-Domain experts -Domain novices	Perceived work task (the actors' reaction to a simulated work task: labeling game)	Domain (not related to a particular org.context) + international	Film clips	Tags	·Personal factors ·Perceptions and attitudes towards tagging ·Familiarity with the source ·Familiarity with tagging ·Background knowledge and expertise level ·Motivations for tagging ·Annotating habits and motivations ·Cognitive aspects ·Attitudes towards sharing annotations ·Tagging process as a cognitive activity ·Participation style ·*Types of annotations (and their use)* ·Document-related factors ·*Media-related factors*
Annotating behavior	B	Domain experts	Simulated work (annotation) tasks	Academic (different universities) + cultural (Spanish)	Film clips	Annotations	
Information seeking and search behavior	C	Domain experts	Natural work tasks + Perceived work tasks	A media studies department + A film archive	All types of sources (media independent) related to film	Search terms	·*Actor (declarative knowledge and procedural skills)* ·*Perceived Work Tasks (the actor's perception of the work task)* ·*Perceived Search Tasks (the actor's perception of the search task including information need types regarding the task and the task performance process; emotions)*

[64] Elements in italics are directly associated to the thesis' main research problem. According to the data analysis approach followed in this thesis (which will be explained in the next chapter (§4.7), the elements identified in the literature review that originated this list, are used as a guidance during the open coding phase.

3.6.2. Limitations and implications

As it was suggested before, the fact of selecting a macro-model as a theoretical framework has advantages, but also limitations. Since the selected model is a macro-level model (i.e., a framework), it helps in identifying the nature of the interactions, and the factors and actors affecting it, but it does not account for key specific issues. Micro-models, on the other hand, are easier to translate into study design or into an explanation of how and why people behave in a certain way in relation to information.

As Xie (2008) points out: "while [macro] models emphasize the theoretical implications for research on information-seeking and search, their impact on practical implications, especially the design of interactive IR systems, is not as significant as their theoretical implications" (p.197). However, together with Hollink (2006), it is possible to argue that knowledge about users behavior is one way to improve the performance of retrieval systems (Hollink, 2006, p. 50).

Also, the adopted model can be either used as guidance for research design or be the object of validity testing. In this case, the value of the adopted model is that it applies to any cognitive actor in context, and it is hospitable to a wide variety of information behaviors (p.263), including information-annotating in this case. It is thus, only used as guidance for research, according to the explorative nature of this investigation.

Using Wilson's (1999) terms, both the limitations and the advantages of the selected model, can be summarized in that it provides a map of the area and draws attention to gaps in research. Indeed, since it is not a "process model", that is "no steps in interaction are explicitly modeled" (p.263), it does not allow to explain the details of activities or processes that take place in practice. However, its advantage is that it facilitates analyzing the main elements or categories involved, together with their relationships (p.263).

One important aspect to be considered in the limitations of the model is that the cognitive viewpoint itself has been subject to criticisms. Fidel explains in relation to the cognitive models of information seeking and retrieval: "it is not surprising that the models that bind HIB and IR (e.g., Belkin's and Ingwersen's) are cognitive; cognitive processes and attributes are considered generalizable to all humans, regardless of context and situation" (Fidel, 2012, p.208).

Contrarily, the authors of the IS&R model state that they have extended the cognitive view point to cover different dimensions (technological, human behavioral and cooperative aspects), also expanding it to other domains beyond the academic (for instance by integrating leisure and cultural information seeking into the framework) (p.3.77), and Fidel (2012) also acknowledges in a later publication that while Ingwersen's (1999) model was primarily cognitive, it later introduced socio-organizational elements.

Studying the model itself in detail is not within the scope of this investigation. However, the analyses presented in this chapter have shown that the IS&R framework is the most

comprehensive yet precise model that can guide the proposed investigation of the suggested field of "information-annotating behavior." For the most part, this thesis takes the aforementioned criticisms, by incorporating Ingwersen and Järvelin's suggestions to study the actors not only in what relates to cognition, but also to emotional states (p.382). This relates to the ethics of this thesis' studies, which are based on a participant and constructive dialog with the participants, assuming the interpretative (subjective) nature of the thesis' author observations.

3.7. Information-annotating behavior as an area of IB research

The theoretical exploration presented in this chapter with the aim of providing a framework for the study of annotating-related behaviors, lead to broader conceptualizations. One of the implications of proposing a holistic concept of annotation and the study of "information-annotating behavior" in an IS&R framework, is a natural transformation of the IB research areas presented at the beginning of this chapter (Figure 3.1)

Wilson's (1999) nested model of the information seeking and information searching research areas (Figure 3.1) favors the focus of IB towards seeking and searching, which does not correspond to the comprehensive view of this discipline that Wilson himself defined in his 1999 paper. In sum, although the annotation phenomenon itself is not new, its identification and modeling are not yet part of information behavior (IB) studies even though there are empirical investigations that analyze several of its aspects, as it is reflected in the great variety of topics identified in Section 3.4.2.

The proposal in this section emerged after the analyses presented until this point in the thesis; however, a predecessor to the idea of regarding annotation as part of IB studies is the important suggestion by Ruvane (2006). She suggests in her short paper the idea that annotation (as performed in the analog and digital world) is a kind of information behavior. However, her proposal, briefly introduced in a poster presented at one of the ASIS&T annual meetings and published in its proceedings, does not seem to have been developed further by her or other researchers. Hence, to the best of our knowledge, this gap has not been identified in the literature, and it is possible to suggest a change after this evidence[65].

Figure 3.14 illustrates the proposal to represent graphically the analyses presented in this chapter, by extending Wilson's (1999) nested model of the information seeking and information searching research areas (Figure 3.1).

[65] In order to validate this observation, this thesis' author consulted P. Ingwersen about the possibility of considering "tagging" as a type of IB. The Professor acknowledged this idea, and commented: "Most literature on IB is related to information seeking (and IR). [However,] in the current information landscape, seeking is increasingly connected to activities like tagging, authoring, revision, etc. Hence, it is completely natural to look at tagging as IB" (P. Ingwersen, personal communication, May 30, 2013). At the same time, an important article conveying similar ideas was encountered: Ruvane (2006). It seems to be the only one suggesting including the study of annotation as a human behavior into IB use studies. However, the author only briefly introduced her idea in this poster presented at one of the ASIS&T annual meetings and published in its proceedings, but did not put forward a proposal, and does not seem to have been developed it further.

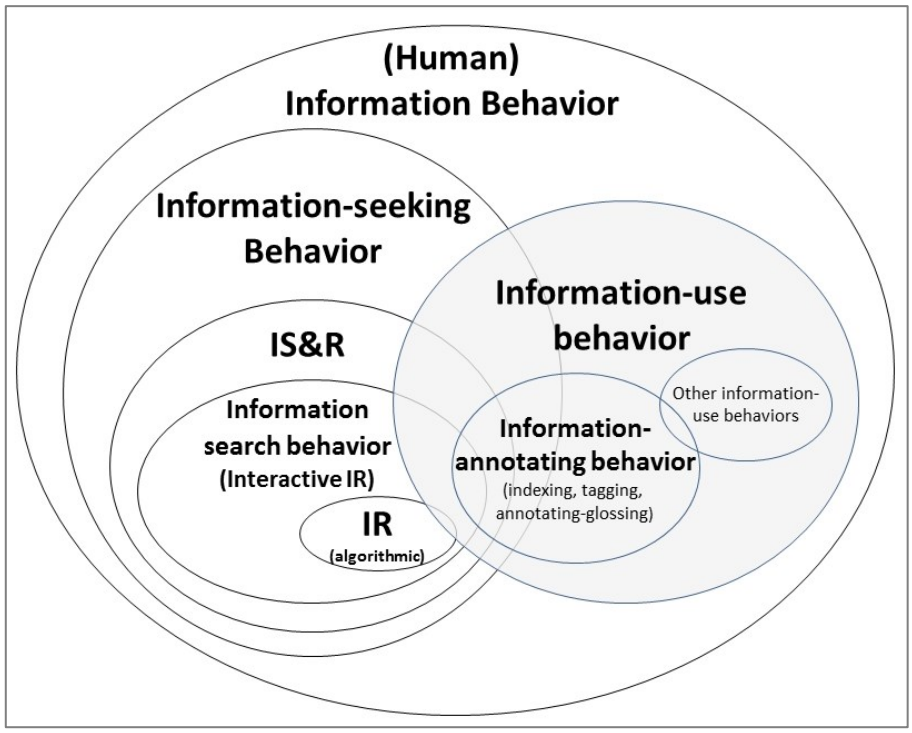


Figure 3.14. Information annotation behavior as one kind of information behavior
(adaptation by this thesis' author of Wilson's, 1999 diagram; and Skov, 2009)

The previous figure shows where information-annotating behavior studies could be placed into the broad field of IB studies, and how this type of behavior could be seen as a sub-area of information-use behavior studies. In addition to Wilson's original research areas, the fourth circle on the left corresponds to Ingwersen & Järvelin's (2005) adaptation of Wilson's nested model of IB (The Turn, p.198), subsequently adapted by Skov (2009), as shown in Figure 3.15.

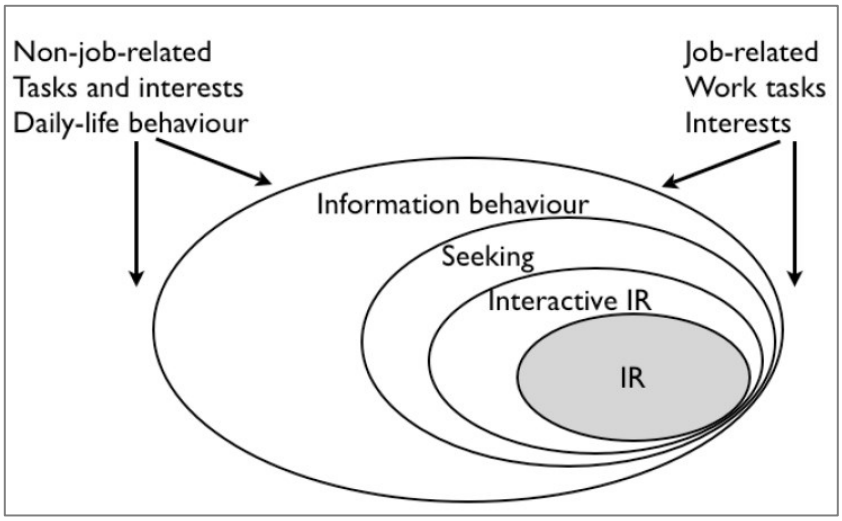


Figure 3.15. "Nested model of information behavior" (Skov, 2009, p.18).
(Extended by Skov from Ingwersen & Järvelin, 2005, p.198, and Wilson, 1999, p.263)

The diagram in Figure 3.14 echoes Ingwersen & Järvelin's intention of showing how these research areas are interconnected. Indeed, an integration of IB and IIR research is needed in

order to understand and support the wide variety of people's interactions that take place in (or through) current information processing systems. Together with Belkin's (1980) "Anomalous state of knowledge" (ASK) model, the IS&R framework originated in the IR community (Fidel, 2012), that is why, according to Fidel, the authors use the term "information retrieval" instead of "information-seeking behavior" in the name. However, Ingwersen and Järvelin's framework seeks to integrate and looks for collaboration between HIB and IR researchers. Although it does not claim to cover IB as such, it provides perspectives for IB research (p.259). More importantly, its inclusion of the cognitive actors as the center of the model places the importance of understanding the role of their "cognitive space" during information seeking, making IB research necessary.

Furthermore, studies under the cognitive viewpoint nowadays not only look into the systems of categories, but also to the actions that reflect cognitive activities and are observable (e.g., querying, saving a document, providing relevance feedback) (Kelly, 2009, p. 3), in this sense, these confirms an overlap with IB studies. Likewise, Toms, Villa, & McCay-Peet (2013) observed that studies that look at what happens after identification of relevant items using an information retrieval system are scarce in IIR research, even though, as these authors found out, two-thirds of time spent on a broader work task were used after finding a relevant set of documents, and that time was mainly spent reviewing documents that had already been retrieved. Their conclusion is that an "ultimate challenge will be in building useful systems that aid the user in extracting, interpreting and analyzing information to achieve work task completion" (p.9).

Consequently, the new circle added to Wilson's (1999) in Figure 3.14 indicate that his original areas overlap with information-use behavior, because as suggested above, information use events happen simultaneously with seeking and –currently- with search behaviors during the same search system and session. IS&R studies are also added as an instance of IB, and an inner area of "information-seeking behavior," since "the central IS&R phenomenon of study consists of the processes of information interaction and acquisition in a work task context" (Ingwersen & Järvelin, 2005)[66]. "Interactive IR" studies are also interpreted to be part of "information search," though not as a sub-area, but more as an overlapping field of studies.

Adding information-use behavior as an IB research area seems to be natural because of the previous arguments, but also because the author of the initial diagram (Figure 3.1), Wilson (1999), already claimed that "one of the results of the analysis that led to the [original] diagram was the recognition that **information use** had received little attention." What this thesis adds to the theory of IB research is the inclusion of information-annotating behavior studies as a specialized field of the (now graphically visible) information-use behavior

[66] There is evidence for this choice in at least two mentions about the relation between IS&R and IB:
"The IS&R framework does not claim to cover IB as such. But it may contribute fresh perspectives for IB research, for example, by suggesting studies of relationships between information use and generation (arrows 2, 5-6) [Figure 8.4]" (Ingwersen, 2005, p. 218).
"In IS&R viewed as instances of information behavior, they take the form of transformations and interpretations made by the variety of human actors that participate in IS&R" (The Turn, p.259).

research area.

The definitions and conceptualizations of each of these research areas have already been done by several authors. However, the area of "information-use behavior" is the less studied. Wilson's (2000) definition of "information-use behavior," conveys some of the ideas of what this area is about:

> "Information Use Behavior consists of the physical and mental acts involved in incorporating the information found into the person's existing knowledge base. It may involve, therefore, physical acts such as marking sections in a text to note their importance or significance, as well as mental acts that involve, for example, comparison of new information with existing knowledge." (p. 50).

In spite of the definition proposed by Wilson in 2000, Kari's (2010) literature review on the topic led him to observe that "it is seemingly difficult to capture information use, as the concept is often vaguely defined even in research studies, or it is not defined at all." In his analysis of the publications that use the concept "information use", Kari identified seven "conceptions" of this term (including, for instance, "information processing", and "knowledge construction"), which could offer the basis for future work in the theory and research of information-use behavior.

Information-annotating behavior studies, as shown in the proposal above, could be one important (and transversal) sub-area of information-use behavior studies. A definition of this proposed sub-area is proposed at the end of this thesis (§8.4). The underlying goal of studies in this sub-area would be to provide solutions that support manual annotation as well as automatic or semi-automatic annotation for improving information use. There may be other sub-areas or broader topics in the field of information-annotating behavior studies, which are represented in the circle "other information-use behaviors" in the figure, for instance, studies on reading behavior (which overlaps with other disciplines, but could also have an IB distinctive perspective).

Last, IR (algorithmic) is the most focused and technology-oriented research area within information-seeking behavior studies which could also overlap with "information-annotating behavior" studies. An example would be IIR research that seeks to use the polyrepresentation principle in order to design algorithms that can combine user-generated metadata with more traditionally automatically generated indexes, or research about processing data related to (cognitive) provenance and users' interactions data with IR systems when annotating.

Finally, Wilson's (1999) paper anticipates the possibilities for expanding existing IB models to represent an interdisciplinary link with communication studies, when he introduced the graphical representation labeled "linking information seeking and communication" in his article (p.264). This thesis follows the trait of this interdisciplinary link (see §6.6).

The proposal discussed in this section will be discussed at the end of this thesis (§8.4). Next, Chapter 4 presents the methodological issues of this work and the research design.

CHAPTER 4. Research Design and Methods

"All researchers, whether working in the humanities, the natural sciences, or social sciences, have a philosophical stance, whether or not they recognize it. Even declaring a commitment to be objective, free of any philosophical approach, is a stance" (Fidel, 2012).

4.1. Chapter overview

This chapter presents the research design and methods adopted in this thesis which are informed by the theoretical framework described in Chapter 3.

First, Section 4.2 recaps the underlying research paradigm and theoretical perspectives. Next, Section 4.3 details the chosen methodological approach. Section 4.4 revisits this thesis research design, which was outlined in the introductory chapter (§1.4). Section 4.5 describes the overall research method used in this research, namely, a case study, and introduces the specific methods used in each particular study. Section 4.6 summarizes the main data collection techniques and instruments, which are detailed in each individual study. Likewise, Section 4.7 summarizes the general procedures followed for the data analysis. Finally, Section 4.8 offers a brief discussion about the implications and limitations of the selected thesis method and research design.

4.2. Terminology and research paradigm

There are differences in the research methods literature terminology. In this work, the terms and concepts by Pickard (2007), and Pickard and Childs (2013) are adopted. Figure 4.1 presents an overview of how these concepts have been applied in this thesis.

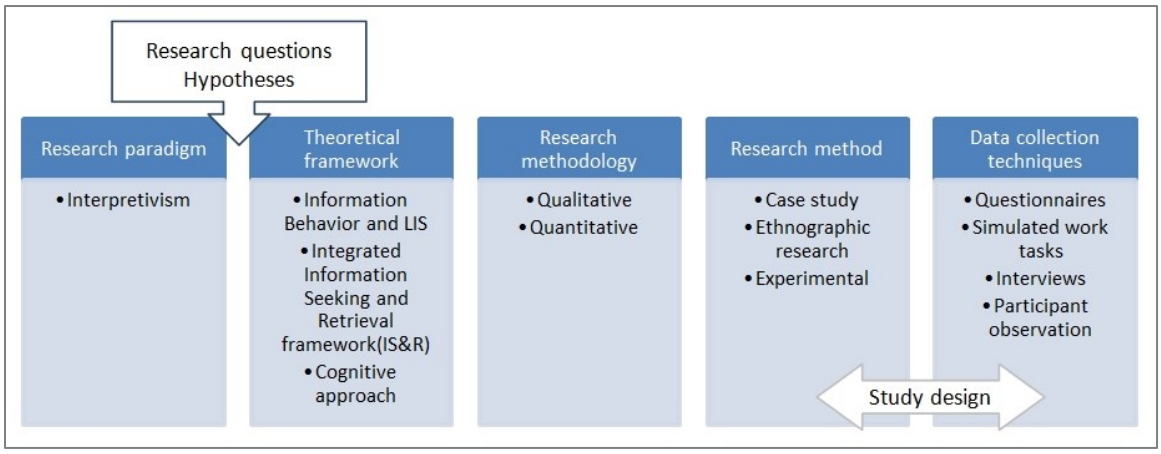


Figure 4.1. The research hierarchy (adapted from Pickard & Childs, 2013) applied to this thesis work.

Pickard (2007) defines a "research method" as the overall approach and system created by the researcher to engage in investigation (e.g., experimental research, case study, or survey).

It is the researcher's strategy to address a research question or verify a hypothesis. Each research method uses different "data collection techniques", which are the strategies for collecting data (e.g., a questionnaire in the case in the survey method). These data collection techniques require the use of certain "research instruments" (e.g., an online questionnaire).

The selection of a research method depends on the researcher's assumptions about how knowledge is created. At a deeper level, these assumptions originate from underlying research paradigms and philosophical stances, such as positivism or interpretivism. These paradigms are not always obvious to the researchers since they are tied to world views and educational backgrounds and traditions in which they are immersed. However, research paradigms have a crucial influence on the research process and implications for the nature of the research outputs and their impact.

Theoretical frameworks (added to Picard and Childs's research hierarchy of Figure 4.1) originate in the context of different disciplines. This thesis' theoretical framework (described in Chapter 3) originates from the of LIS and IB disciplines. Within these disciplines, the theoretical model adopted was the IS&R framework described in the previous chapter. This model is itself framed in broader theoretical stances such as the cognitive approach (§3.3.3).

The overall topic of this thesis work (i.e., annotation of moving images) has been mostly investigated within the LIS and IR disciplines from a positivistic and pragmatic approach. Even though it is not common in the research literature on tagging, indexing or annotating to find an explicit declaration of the paradigms or epistemologies being followed, it seems to be more common to assume the separation of the researcher from the reality being investigated, and a controlling and experimental attitude towards information technologies in order to improving the outputs of the annotating processes. However, in more recent years, the turn in IR research and the IB discipline has brought interpretivist approaches to research in the aforementioned disciplines (see also §3.2). This connects to Pickard's conclusion, that even though disciplines usually have a dominant paradigm at a specific time, LIS does not have one due to its diverse nature, even though the interpretivist approach is starting to be widely adopted (Pickard, 2007, xvii).

This thesis work has an underling paradigmatic approach closer to interpretivist than to positivist research. In that sense, the object of study is not considered as an independent fixed entity to be discovered, but more as a multiple and changing reality that the researcher, I (together with those who collaborated in the process), interpret as a result of our interactions with information and with ourselves. This agrees with Hamel and others observation that "the purpose of the study is defined within the context of the 'social actors' inhabiting the study; it is they who are at the heart of the investigation with their own experiences and the meanings they attach to those experiences" (Hamel, Dufour and Fortin, 1993, as cited by Pickard, 2013, p.105).

Even though this thesis includes experimental settings, there is no attempt to formulate generalizations at a scientific level. Contrarily, this thesis seeks understanding through

interpretation, and assumes that the interactions with information are influenced by (and can influence) the contexts, experiences and exchanges between people and technologies.

4.3. Methodology

Research paradigms are associated with methodologies; the latter, according to Picard, can basically be qualitative, quantitative, or mixed. Methodologies are the general viewpoints that the researcher could select from in order to approach the research questions. Generally speaking, quantitative methodologies are associated to positivistic views, while qualitative research is more related to interpretivism, and post-positivism thinking. The attempt to combine both methodologies is called “mixed methods” or “mixed methodology” (Pickard and Childs, 2013, p.xviii).

This thesis is based on a mixed methodology approach. Overall, the emphasis is on qualitative methodologies, since the thesis seeks analytical description by using quantitative analysis as guidance in finding evidence of salient relevant aspects for the investigation. Rather than verification by using hypotheses testing (which characterizes quantitative approaches), this thesis is guided by research questions. This implies a degree of subjectivity, which does not mean that there is no aim for accuracy.

4.4. Research design overview

The nature of qualitative design calls for openness and iteration (Pickard, p.52). This thesis’ research design is the result of a recurrent process which developed at the same time that the researcher gained insights about the different issues involved in the case (Pickard & Childs, 2013, p. 102).

As indicated in Section 1.4, this thesis is composed of three studies. Each study has its own unit of analysis (different groups of participants), research method(s), data collection techniques, and research instruments. Each study is described in one chapter, where these details are included (Table 1.3 presents an overview).

In addition to the three studies that are the actual constituents of this investigation and thesis, there was a possibility for the researcher to participate of a three month internship at The Eye Film Institute in The Netherlands (EYE), between May and August, 2014. During this stage, two “extra studies” were conducted: one of the user requirements for improving access to the collections through the online catalog, and a user requirements study for the development of a “demonstrator” for one of the archive’s collections (a brief summary of that study is presented in Appendix O to serve as a background). The results from these two studies are not included as such in this thesis, but the overall findings provided evidence during the data analysis (mainly during the writing and interpreting phase, §4.7).

Since one study’s answers lead to new research questions for the next one, this thesis’

research design was iterative, that is, it was not established a priori, but gradually emerged after the initial literature review, proposal of the theoretical framework, and the initial study (Study A). The studies are thus presented in chronological order, as they developed along the research project.

4.5. Method: Case study

A research method, as defined above, is an arranged system created by the researcher in order to accomplish the purpose of the investigation. There are different methods that follow a qualitative methodology approach, for instance, ethnography, action research, Delphy studies, and case studies just to mention a few.

Several research methods are used in IB studies, both of quantitative and qualitative nature. Wilson (2010) identified that in the initial years of IB research, studies used to be quantitative, but around 1980, qualitative perspectives started to be used and have become the norm for the studies in this field. Fisher et al.'s (2005,) statement that "information behavior researchers are committed to qualitative methods" (p.107) seems to acknowledge this idea. As Kelly also indicates, the inclusion of users in IIR studies makes it a behavioral science, calling for appropriate methods that unify these research traditions (Kelly, 2009, p. 4).

The case study method was selected for this research since the potential groups of domain experts within the audiovisual heritage domain (the niches) is too broad to be investigated by a single individual. For this reason, a particular domain within the several possibilities had to be selected as a case (see 1.5 where the reasons for choosing this domain are described). In addition, previous literature indicates that this method is suitable when the researcher wish to obtain an in-depth understanding of a relatively small number of individuals, problems, or situations (Patton, 1990, as cited in Zach, 2009, p. 5). A case study can also be seen as a way to fulfill the requirements of a qualitative approach, namely describing, understanding, and explaining (Tellis, 1997). Additionally, the case study method is argued to be the best choice if one looks for a method to study the particular within context (Pickard & Childs, 2013, p. 102).

Case studies require a unit of analysis. According to Pickard (2007) this unit could be: (a) an individual, (b) a group, (c) a community, (d) an organization, or (e) a program or a system, which can be part of an organization, department or service. Different authors propose certain criteria to limit the unit of analysis, for instance, by geographic area, time restrictions, boundaries, or limits of data collection. It is also common in the literature of case study design to distinguish between holistic or embedded case studies. In a holistic case, the case is at the same time the unit of analysis, that is, the case cannot be divided into small parts that would be studied individually. In an embedded case, two or more units of analysis are required.

The selected method is an embedded case study. The unit of analysis that encompasses the smaller cases corresponds to a group of scholars that share a knowledge domain within the

humanities (i.e., film and media scholars). That is, the participants belonging to the case may be located in different places, and their social and organizational contexts may be multiple, but what makes them be part of the case study is their expertise in a domain.

Other approaches for studying expert content annotation of moving images were considered (within the scope of these thesis' aims), such as studying the use of audiovisual sources by humanities scholars. However, several IB researchers coincide in that it is more advisable to study smaller and specific groups. Additionally, considering the group of film and media scholars as a clear unit of analysis facilitates the study of the connections of a group of experts with an established type of memory institution, such as film or television archives. This is related with one of the aims of this thesis, which is to contribute to improving access to audiovisual heritage, and this is in great part enabled by specific organizations such as these ones.

The case study is composed of individual cases. Each individual case has its own unit of analysis. The boundaries of each individual case were delimited differently: in Study A, the group of experts was randomly selected; in Study B, the boundary was geographic (a group of scholars working at different universities in the same region); and in Study C, the group was smaller and related to a specific academic department within a university. These three groups made up the bigger case. In that sense, this thesis used embedded case studies. Multiple-case study design presents challenges for interpretation, but gives advantages in that it enables triangulation (Yin, 2003, p.47). This tension is expressed by Fidel, who indicates that a case study, "attempts, on one hand, to arrive at a comprehensive understanding of the event under study but at the same time to develop more general theoretical statements about regularities in the observed phenomena" (Fidel, 1984, p. 274, as cited in Zach, 2006, p.5). Indeed, this thesis investigation fluctuates between being an "intrinsic" case study that seeks to describe and gain a better understanding of each case per se, or an "instrumental" one that looks at a particular group or situation mainly to provide insight into an issue or to redraw a generalization (Stake, 2003, p.137). As a result of this tension, the two first thesis' studies (A and B) are in a certain way more instrumental than the third one (C).

4.6. Data collection techniques and instruments

Several techniques are employed in this research for data collection, depending on each study. Those include a video labeling game, questionnaires, interviews, primary documents (manuals, reports), simulated work task situations, protocols, and diaries or records (for observation notes and memos, or structured observations to publications or websites).

Since the three studies conducted in the research involved people who were domain experts, the selection of participants was mostly done through "purposive sampling", and "snowball" sampling, following other participant's recommendations in selecting the key informants. The participants were chosen by their deep knowledge or relevant experience in relation to the case.

Table 4.1 shows a summary of the different methods, data collection techniques and research instruments used in each of this thesis' studies (it expands Table 1.3 presented in the introductory chapter).

Table 4.1. Summary of research methods and data collection techniques

Study	Theoretical framework	Method	Data collection technique	Research instruments
A	Tagging behavior (§3.5.3)	Experimental research	A tagging game	-Video labeling game (Appendix D) -Questionnaire (Appendix E)
B	Information-annotating behavior (§§3.5;3.5.4)	Case study	In-depth interview aided with a simulated work task situation	-Session protocol (Appendix F)
C	Information behavior (IB) (§§3.2; 7.3)	Case study	Interview session (focused in-depth interview)	Interview guide (Appendix J)

In addition to the aforementioned data collection techniques used for each study, two complementary sources of data were important in this research:

(1) A structured observation to the websites of film archives. As part of the preliminary work for this thesis, for identifying *crowdsoucing* initiatives in the audiovisual heritage domain was conducted in 2012 and revised in 2015. In addition to look for *crowdsoucing*/*nichesourcing* initiatives (Appendix N), the observation was also oriented to identify services to researchers, ways of presenting the collection, and participation in the social web (for instance, by having a YouTube channel). This information provided background knowledge to the researcher in order to make more informed interpretations during the analysis.

(2) The data collected during the "extra" studies, introduced in Section 4.4, as part of a three month internship at one film archive.

4.7. Data analysis general approach[67]

One of the advantages of data collection within a multiple case study is that it facilitates triangulation (§4.6), since it allows having different perspectives from different sources which complement each other (Pickard & Childs, 2013, p. 102). Indeed, as a result of the mixed methodology and the multiple case studies, the data gathered in this research is of different

[67] The procedures described in this section are derived from different texts on qualitative data analysis using a GT approach, but they are mostly informed by experienced researchers who have used them and shared their experience, I wish to thank my DILL colleague Getaneh Alemu for his inspiring PhD thesis (Alemu, 2014), and acknowledge Dr. Lynn Connaway for sharing an example on their research code book, and for giving crucial advice on the topic.

nature, ranging between outputs (tags, texts), interactions with a system (as in Study A), "cognitive data" or observable behaviors, spoken language (during interviews), interview transcripts, questionnaire data, and auxiliary data (e.g., publications by the scholars, manuals, or project reports).

The advantages that these data represent for triangulation are positive, but at the same time they represent one of the most challenging aspects of the data analysis process. The need to interprete data coming from different perspectives relying on multiple sources of evidence, at the same time having the possibility of analyzing each data set individually, or comparing and looking for convergence, justified the selection of a Grounded theory (GT) approach to the overall data analysis. GT is often referred to as a research method (Pickard, 2007, p.155) or as a methodology (Corbin & Strauss, 2008, p.1). It was proposed in 1967 by Glaser and Strauss and has influenced qualitative research since then, due to the suitable methodological implications of its epistemological and ontological assumptions for the kinds of realities and issues that are researched in the social sciences. Its nuances are varied and there are different implications for practical research.

Corbin & Strauss (2015) define the purpose of GT as "building theory from the data". However, Pickard (2007) makes the distinction between GT: 1) as a method of qualitative research and 2) as a qualitative data analysis technique. In the first case, GT as a research method, the purpose is to build "theory" by approaching the reality without a predefined coding or categorization of the object of research, but with the intention of letting these categories emerge from the data collected, as if the theory was "grounded" in what is being researched. This is a challenging issue for the researcher, since (s)he has to let behind preconceived ideas and follow the path traced by the data (Pickard, 2007, p.163). In the second case, GT is a more generic approach to qualitative analysis of the data whether or not the purpose involves the development of theory (Corbin & Strauss, 2015, p. 7; Thornberg & Charmaz, 2013). This second approach is adopted in this thesis, since its aims are not to develop a new theory, but to explain an emergent phenomenon through it.

GT as a generic approach to data analysis relates to other techniques in qualitative research. For instance, they can include: conversation analysis (CA), various forms of discourse analysis, and some variations of narrative analysis (Roulston, 2010, p. 60). The GT approach to data analysis is based on the "constant comparative method," first explained by Barney Glaser, which is a basic strategy of comparing data with data (Roulston, 2010, p.156). This comparison is facilitated by coding the data based on conceptual properties and dimensions of the data, writing memos that support the analytical work of the researcher, and finally interpreting all the analyzed data.

More fine-grained views of GT point to different approaches to the coding process, the researcher's intervention, and the use of the literature to support the coding. In the "constructivist" view (represented by Charmaz, 2000; 2003; 2006, , "coding is about 'naming segments of data with a label that simultaneously categorizes, summarizes, and accounts for each piece of data" (Charmaz, 2006, p.43, as cited in Thornbert & Charmaz 2013). This is

composed of at least two phases: initial coding and focused coding. Other authors call this data analysis procedure as "inductive content analysis methods" (Yang & Marchionini, 2004; also Schamber, 2000, as cited in Kirkegaard & Borlund, 2008).

In general terms, the data analysis was done in this thesis in a "constructivist" way, as described above, by coding the data through "conceptual analysis" (Sowa, 1984) in an iterative process, constantly increasing the stability of codes and categories from the collection and analysis of all sorts of data sources. This is what Sowa calls "conceptual analysis", meaning that "creating a precise, formalizable catalog of concepts, relations, facts, and principles" is the goal. In practice, the following steps were followed:

(0). Pre-data collection phase.

The main issues related to the initial research problem and questions are identified through "theory sampling," based on literature reviews and analytical thinking. Based on this, a theoretical framework emerges, together with the main dimensions or variables to be investigated (3.6.1), and each study and data collection techniques are designed.

(1). Initial coding (open coding).

Specific codes are assigned to each piece of information based on what the data in itself was contributing to the research questions, at the same time guided the elements identified in Section 3.4.2. The unit of analysis was different in each case (as it is explained in the corresponding data analysis section included in each chapter from 6 to 7), but the general approach was to "code" significant units. The general aim during selecting or assigning a code is to answer questions such as those suggested in (Thornberg & Charmaz, 2013, p. 156):

- What category does this incident indicate?
- What is actually happening in the data?
- What is the participant's main concern?
- What process(es) is at issue here?
- How is the participant involved? What is his/her idea or opinion on the process?
- What might his/her observed behavior indicate?

The resulting codes emerge from the data in most cases (for example, in the case of interviews), and in other cases they are pre-defined (as in the case of the broad semantic categories proposed in Study A, §5.4.7). At the same time, the researcher writes memos, which support the analytical work. Following recommendations by the qualitative software community, memos were used for different purposes (i.e., methodology, theory, analysis and tasks). The "Analysis" memos are properly tied to the research questions. The other memos are used to support the research process, for instance, the "tasks" memos are used for internal work duties (for instance, to register ideas on extra things to do based on the analysis); the "methodology" memos are used to keep reflections on the process itself, they constitute the "research diary"; the "theory" memos are used to trace further references that needed to be located.

In light with the "constructivist" approach to GT, the previous body of literature (reviewed in Chapters 2, 3, and for each study, summarized in Table 3.2) is used in this phase as a source of concepts and terminology for coding based on the theory. The two following quotes by experts in this type of analysis define the importance and characteristics of this step:

> "This search for the phenomenon of interest is theoretically driven -that is, theoretical perspectives and research purposes govern what analysts look for in data. Yet, qualitative analysis emphasizes the importance of remaining open to what is in the data, rather than simply applying concepts imported form literature." (Roulston, 2013, p.305).

> The aim was to keep the balance between an open mind (being "surprised" by the data (Thornberg-Charmaz, 2013)) and a conscious awareness of existing knowledge.

The next step is closely related to this one and, in some cases, difficult to differentiate.

(2). Reorganizing, classifying, and categorizing data

This is also called the "focused, selective phase," or "focused coding" (Charmaz, 2006, p. 46; 57). The emergent codes from the previous phase are normalized, looking for commonalities and patterns, in order to create a set of categories. It is a phase in which the researcher reassembles the data, codes and comes up with initial, not yet stable categories. The memos are used to support the creation of "statements" or explanations about the topics. Roulston (2013) summarizes this stage:

> "By developing the codes through an iterative process involving reading, focused coding, reflection, writing and rereading, researchers make connections between ideas, collapse codes into larger ideas (variously called themes or categories), and begin to develop assertions concerning the phenomenon of interest. Although researchers may vary in their theoretical approach, what is common in this phase of analysis is that researchers discern the key concepts concerning the topic of study, reflect on prior understandings and initial assertions, and search iteratively through the data set to check, recheck, and revise preliminary ideas about the topic of study." (p.305)

The tangible output of this phase is a "code book" that is created initially for Study B, then updated with the codes from Study C, and subsequently unified as the overall thesis code book (presented in Appendix B). This instrument is developed for the own use by the researcher during the previous two steps in order to keep consistency in the coding.

Also in this phase, quantitative analyses were performed for those studies that required them, through the use of simple statistical methods, which are described later in each study's corresponding chapter.

(3). Interpreting and writing up findings.

This is the "theorization" part of the process (Charmaz, 2006, p.96) Steps 1 and 2 are done iteratively during the research process. Finally, the resulting, stable categories related to the research questions, and the research memos, come together in this phase, where the findings are finalized. In this phase, mostly analytical activities take place, by combining memos and

creating diagrams to create the theoretical categories (Charmaz, 2006, p.96).

Because this thesis is composed of three different studies, the previous three steps were done several times during the research period with different dedication degrees. For instance, literature reviews had to be conducted across all phases, especially in the beginning of each study; but it was most intensively done in the initial phase of the overall project.

Finally, as part of the personal information management strategy for the project, the researcher decided to use different user-friendly "tools" that could help in the process. The most important ones being: (1) a reference management software; (2) a QDA package for this data analysis process, (3) a web-based software for audio coding; and (4), a package for statistical analysis; and (5) an "Excel" workbook.

In relation to secondary literature, the reference management software selected for the project, Zotero(rw), proved to be useful because of the option to use tags and collections, but mostly because of its flexible compatibility with browsers and word processors. This software was used also to "code" the secondary literature through tags. The sources were coded at the item level.

In relation to the primary research data, there are different QDA packages that enable annotation during research (also mentioned in §2.8.1); even though the researcher was familiar with the "Atlas.ti" software, "Nvivo 10"(rw) was selected for its flexibility to handle audio materials and their transcripts. Because of the characteristics of audio material, and the length of the audio recordings used in studies B and C, a combined verbatim and summarization transcript for each recording was adopted. This was done using specialized transcription software[68] for one of the studies, and an online audio annotation program[69] for another study. This was done as an intermediary step between the QDA package. Indeed, "Nvivo" also allows these transcriptions, but since it is not web-based, it does not facilitate the transcription or audio annotation task in the case of changing working places or computers. Lately, the audio and the transcript were imported and synchronized using the selected "Nvivo" package facilities. Together with the audio, also other data and sources were imported. This was done in two phases: audio transcripts, notes and primary documents first; and questionnaires and quantitative results in a second phase. The secondary literature was not imported or coded into the system.

All the primary research material was coded at different levels of granularity, depending on the type of material and the type of analysis. These procedures are detailed in each study. Triangulation for interpretation was facilitated by coding each participants' data (e.g., background, institution, case study, research focus), and linking each participant's record to the corresponding research data. Furthermore, during the second phase above (i.e., reorganizing and classifying), a series of "inter-annotator" agreement tests took place. For

[68] Express Scribe Transcription Software 8 http://www.nch.com.au/scribe/)

[69] Synote(rw), a very useful time-based, and web-based annotation software designed by Professor Mike Wald, from University of Southampton, who generously provided guidance when needed.

this purpose, the guidelines in the "code book" were written in a more detailed text for the person who accepted to contribute with the annotation. When the agreement values were low, re-classification was done in the problematic areas and the code book was changed accordingly. These procedures are described in each case. The resulting "thesis code book" is included in Appendix B. It is important to clarify, that in the different studies presented from Chapter 5 to 7, the groupings are named *"classifications,"* which receive a consecutive number in the thesis. This number facilitates consultation for the reader.

In the case of questionnaires or annotation outputs (e.g., tags), the analysis was also performed using an intermediary step: through the "Excel" workbook each annotation was categorized according to the different classifications used in the corresponding study. The quantitative results were obtained through the use of pivot tables. These results were entered in the QDA, associated to each participants' data, and in the the statistical analysis software package, IBM's SPSS$^{(rw)}$. Ordinal data were assigned a number as given in the five-point scales on the questionnaires; textual data were coded using categories developed from the data; and nominal data were coded using an assigned number for each type of response (e.g., 1 for ''yes,'' 2 for ''no'').

After having described the motivation and research problem, its background, and the theoretical framework and methodology used for the entire investigation, the next three chapters present the individual studies that compose this work, as detailed in Figure 1.1.

CHAPTER 5. Study A: Film Experts' Tagging Behavior of Moving Images: Comparing Experts to Novices Using a Video Labeling Game

"Don't ever get confused by the term "expert' –it usually simply refers to an individual with a burning passion and someone who has been around long enough to learn from their many mistakes" (Pickard, p.xxii)

5.1. Chapter overview

This article presents this thesis' first study, conducted during two phases between August 2012 and March 2014. It consists of a small-scale experiment to investigate the tagging behavior of a group of film experts, as compared to a group of novices. The study seeks the identification of emergent issues in social tagging research applied to film images, following the idea of Lu, Park, & Hu (2010) that successful implementation of social tagging depends on a basic understanding of how users assign tags, what terms they use, and how the tag vocabulary created by users relates to professionally created vocabularies.

First, section 5.2 introduces the study and its research questions. Section 5.3 includes a literature review of prior work related to our study. Section 5.4 explains the experimental design and setting. Section 5.5 reports the findings and discusses them. Finally, the main conclusions and implications for future work are presented in section 5.6.

A shorter version of this chapter was published in the Journal of the Association for Information Science and Technology (JASIST). This work was done in cooperation and co-authorship with Michiel Hildebrand, Victor de Boer, and Jacco van Ossenbruggen, during a research stage at Vrije Universiteit Amsterdam.

5.2. Introduction and research questions

In the cultural heritage domain, social tagging has become an attractive solution to involve the public in the process of describing the objects in digital collections (Oomen & Aroyo, 2011). For example, the Steve museum social tagging project collected a large number of tags that describe artworks (Trant, 2009b).

The *"Waisda?"* video labeling game, launched in 2009 by the Netherlands Institute for Sound and Vision, was used in two projects to collect tags for TV broadcasts and historic newsreels, showing that social tagging can also be applied to the audiovisual domain (Gligorov et al., 2011; Images for the Future, 2009). Together, the two projects resulted in over a million time-based tags that describe the content in the video, for example, a location that is depicted in the video.

Analysis of the tags collected with *"Waisda?"* for TV broadcasts showed that users primarily describe the visual content at a general level (Gligorov et al., 2011). Motion pictures,

however, have a distinctive form and a specific narrative (Bordwell & Thompson, 2003, p. 2) and involve different semantic dimensions compared to TV broadcasts, such as the use of framing, camera movements and composition to express meaning. Tags at this specific level are needed to describe adequately and retrieve film content, for instance, when users do archival footage research, based on shot listings created by archivists (Turner, 2010; Wilkie, 1999) or when film scholars look for specific shot types, typically requiring domain-specific terminology. For film archives, creating shot listings is an impossible task (e.g., the NFTVA archive started with this practice, but could not sustain it when the collection grew, as described in Andreano, 2008). However, detailed access to shot information is necessary for research, as argued by different authors (Andreano, 2008; Auffret & Prié, 1999; e.g., Geisler et al., 2010).

In this chapter we investigate the difference in the types of tags provided by experts and novices with three aims: 1) contributing to the understanding of the role of expert tags for subject access* in the audiovisual heritage domain, in line with the studies on *nichesourcing*; 2) continuing research on time-based metadata and labeling games initiated by the *"Waisda?"* experiments, exploring to what extent a video labeling game can be used to collect tags for film; and 3) contributing to the overall discussion of how social tagging can be applied to the film domain. By *film domain,* we mean mostly fiction movies, not necessarily celluloid films.

To explore the previous aspects, we study three research questions. These are part of the broader *RQ1* (Table 1.2):

RQ1.1. How do film experts tag films compared to domain novices? Do film experts, as opposed to domain novices, reflect their domain specific knowledge when tagging film content?

Tags are a spontaneous way to associate words with digital content, which reflect the users' personal understanding of a topic or their own intentions with the digital resources (Tsai et al., 2011). For that reason, we might hypothesize that domain experts would use their domain-specific terminologies when tagging. We thus study the types of film experts' tags, and compare the differences between film experts and novices when tagging film content in a realistic *crowdsoucing* environment. We analyze, among other things, the distribution of their respective contributed tags through different semantic levels.

RQ1.2. Can we influence the type of time-based tags that users enter with specific instructions based on conceptual frameworks?

One of the problematic issues of indexing/tagging audiovisual content is that there are many levels or dimensions of meaning involved. To address this question, we investigate if experts and novices enter more specific tags when they receive instructions from using different semantic categories that may apply to film content.

RQ1.3. What are the attitudes and perceptions of scholars and professionals towards tagging games? How to characterize their game tagging behavior?

More details about these research questions in the context of the thesis structure are detailed in Chapter 1, §1.2). Next, the main theoretical concepts that are the basis for this study are introduced, and a brief literature review is included.

5.3. Literature review

We discuss four main topics related to our study: social tagging in the audiovisual heritage domain, tags from experts versus novices, guiding the tagging process, and tag categories and models for image description.

Some of these topics have been introduced at a general level in Chapter 2. Here we look at how differences between expert and novice tagging behavior have been studied in relation to visual resources.

5.3.1. *"Waisda?"* video labeling game

This section expands on the literature presented in Section 2.6 on GWAPs applied to the audiovisual domain.

"Waisda?" is a social tagging application and research project in the audiovisual heritage domain. Specifically it uses the idea of games-with-a-purpose (Ahn & Dabbish, 2008) to motivate users to contribute since play and competition have been identified as motivating factors for tagging (Zollers, 2007). It was launched in 2009 by the Netherlands Institute for Sound and Vision. In that sense, it is a unique project of its kind, since it was initiated by an audiovisual institute in collaboration with a university research team, with the purpose of creating metadata that could enhance access to their collections (Oomen et al., 2010; Gligorov, 2011). During the first pilot, the site received more than 12,000 visits, and had over 2,000 people playing, contributing 420,000 tags for 604 video items (Gligorov et al., 2011; Images for the Future, 2009). In the second pilot, approximately 750,000 tags were collected. This is in line with the increasing popularity of human computation games (HCGs) for image description (Goh, Ang, Lee, & Chua, 2011; Goh & Lee, 2011). HCGs are one way of harnessing human intelligence, through the use of computer games, to perform activities that are not possible to automate, such as the distinction between types of fruits in an image or their respective classes (Goh et al., 2011).

The first *"Waisda?"* pilots showed that *crowdsoucing*, in the form of a labeling game, can be also a good way to engage the audiences with the collections while obtaining content descriptors that can enhance retrieval (Gligorov, Hildebrand, van Ossenbruggen, Aroyo, & Schreiber, 2013).

5.3.2. Expert and novice generated tags

One of the key factors in the success of social tagging in engaging different types of users is

the reduction of intermediary steps followed in traditional indexing practices, saving the user from the need for first thinking on a concept and then representing it through the correct term from a controlled vocabulary (Halpin et al., 2007).

Different studies focus on comparing socially generated tags by non-expert users with the metadata created by indexing experts. Following the mentioned pattern of looking at the outputs (tags) to draw information about tagging behavior, different studies focus on comparing the socially generated tags by the non-expert users with the metadata created by indexing experts. Kipp (2011) gives an overview of the methods used to date in the analysis of social tagging research, looking into differences between tags and controlled vocabularies grounded in the historical works of title, author and user keywords. In general, these studies have found that user tags can complement metadata created by experts. For instance, Lu et al. (2010) compared tags created on the social bookmarking site LibraryThing(rw) with subject terms assigned by information professionals according to the "Library of Congress Subject Headings" (LCSH), finding that social tags can improve the access to library collections, except for the presence of non-subject related tags. Likewise, "kinds of tags" was the name of a project that sought the alignment of socially generated tags with the Dublin Core metadata elements (Catarino & Baptista, 2008). The authors found that some dimensions did not have an equivalent in the DC elements (DCMES). Kakali and Papatheodorou (2010) focused on the relation of social tags with subject indexing and in the application of a potential method to align them in academic settings. A great number of studies investigate the overlap between socially generated tags and subject descriptors created by indexing experts (e.g., Heymann & Garcia-Molina, 2009; Yi & Mai Chan, 2009), showing that the types of concepts present in several social tags overlap with subject descriptors, although the indexing behavior of users and professionals is usually different.

Other studies look at tag alignment, not with professional indexers created terms but with author-provided keywords (e.g., Heckner et al., 2008). Good, Tennis, & Wilkinson (2009) observed how socially generated tags by domain experts in an academic, social tagging system differ or overlap to professionally created metadata within the same domain. They look at the differences in vocabularies created by domain experts (in this case life scientists) in two academic social tagging systems (CiteULike(rw) and Connotea(rw)) comparing their tags with the metadata produced by institutional catalogs using controlled vocabularies (PubMed, and MESH terms). Their findings were that inter-annotator agreement within the social tagging systems and the agreement between the aggregated social tagging metadata and MeSH indexing was low. However, they also pointed to future possibilities of tagging systems to yield better results, not only by mining the relationships between tags and documents, but in finding ways to exploit the link between users, tags, and documents.

A different perspective for looking at the differences between tags generated by experts and novices, in which we frame our study, is to focus on the relation between the types of tags and the participants' knowledge of the domain, in this case by comparing domain experts' annotations with those contributed by novice users. Tsai, Hwang, & Tang (2011) looked at

whether experts can provide a more consistent and representative set of tags for academic and scientific documents than novices can generate, in the context of nanomaterial technology, concluding that tags chosen by experts yielded better similarity and relevance values in all analyses and that these tags reflected better understanding of the content. Likewise, Wang et al., (2012) investigated how three different groups, according to their domain knowledge (novices, intermediates, and experts) in the area of radiography, would describe images, finding that experts used terms related to high-reasoning or diagnostic knowledge, while novices tended to name more generic objects.

In the visual heritage domain, the Steve Museum Social Tagging Project has devoted important efforts to understanding the relationship between user-contributed tags and their resulting folksonomy, and professionally created museum documentation, but found that there is a small overlap between the two (Trant, 2009c). Matusiak (2006) looked also at this issue by comparing the descriptions created by general users in an image tagging system for a set of images indexed professionally in a digital collection, highlighting that the annotations created by these two approaches can supplement each other. This same conclusion is reported by Springer et al. (2008), who discuss the successful implementation of "The Commons", the Library of Congress project on using the online photo sharing community Flickr to open and disseminate part of its pictorial collections; and by Thøgersen (2013), whose analysis of image tags created through a game, shows that they complement existing metadata and could be integrated into existing workflows. In the audiovisual domain, Gligorov et al. (2011) investigated the overlap between the vocabulary that users employ when describing videos, with professionally created vocabularies, such as GTAA (Dutch acronym for Common Thesaurus Audiovisual Archives). Their conclusions were in line with the previous studies, in that the user tags complement the vocabulary used by professional cataloguers.

A different perspective for looking at the differences between tags generated by experts and novices, in which we frame this study, is to focus on the relation between the types of tags and the participants' knowledge of the domain, in this case by comparing domain experts' annotations with those contributed by novice users. Tsai, Hwang, & Tang (2011) looked at whether experts can provide a more consistent and representative set of tags for academic and scientific documents than novices can generate, in the context of nanomaterial technology, concluding that tags chosen by experts yielded better similarity and relevance values in all analyses and that these tags reflected better understanding of the content. Another study, in the radiological domain by Wang, Ni, Hua, & Chua (2012) explored how novices, intermediates and experts would describe medical images, finding that experts used more high-level image attributes that required high reasoning or diagnostic knowledge than novices, and that novices are more likely to describe basic objects that do not require much radiological knowledge. But Ådland & Lykke (2012) also found, in relation to this distinction between expert and novice tagging, that tags can improve the interaction and communication between layman users and domain experts in a domain-specific setting (health information), by helping to bridge the gap between scientific terminology (and

viewpoints) and the problems reflected in non-expert everyday users' terms.

Kang & Fu (2010) take this distinction a level further, by observing not only the tags or the tagging process of these two groups, but also the exploratory information search behavior of experts and novices using a social tagging system, in comparison to a general search engine. They found, among other things, that expert-created tags can support the understanding of a topic by novices and increase their exploratory search based on the expert tags. Closer to our research approach is the study by Darvish & Chin (2010), who in a small scale study compared film experts and novice tags in a video labeling setting, finding that expert tags were judged to be more relevant by both experts and non-experts, with non-expert viewers also creating significantly better tags than the people who uploaded the videos.

5.3.3. Tag consistency

The principle of the *"Waisda?"* game is that there is a meaningful description when more than one person assigns the same tag to a video (what is called here "matching tags"). This is based on the classification tradition, where consistency of indexing is the main indicator of quality (Tsai et al., 2011, p. 275). Also as Good, Tennis, & Wilkinson (2009) explain "in a social tagging scenario, agreement regarding the tags assigned to particular resources can serve as a rough estimate of the quality of those tags from the perspective of their likelihood to be useful to people other than their authors." When the same tag is used by multiple people to describe the same thing, it is more likely to pertain directly to the important characteristics of the item tagged (e.g. 'VEGF' or 'solid organ transplantation') than to be of a personal or erroneous nature (e.g. 'BIOLS_101', 'todo', or '**')".

5.3.4. Guided tagging

For achieving consistency and quality in the tags, different studies explore mechanisms on how to guide users through the tagging process (§2.5.1). For instance, Smith (2007, p. 128) identified three categories of tag "suggestion systems": previously used tags (suggestions or recommendations based on tags that the user has entered already), popular tags (based on the tags that have been used frequently by others in the tagging system), and recommended tags, which are tags suggested by each tagging system based on their own different criteria.

Melenhorst et al.,(2008) used the concept of "tagging conditions," which refers to different settings for the tagging activity (e.g., basic tagger: with no suggestions; social tagger: tag suggestions come from other participants; and lazy tagger: tag suggestions coming from different sources).

Faceted tagging is another way of guiding the tagging process, by indicating the different aspects of a resource that could be tagged (G. Smith, 2007, p. 76). For instance, Bar-Ilan, Shoham, Idan, Miller, & Shachak (2008, p. 941) found that structured tagging, in the form of guiding the user by presenting "fields", such as "event, symbol, personality, date, place", usually resulted in more detailed descriptions. In a practical application, the tagging project

called “Your Paintings Tagger” [(rw)] guides the users in tagging different aspects of a painting, such as things, people, places, events, subjects, and types. Sen et al. (2006) showed in an experiment on vocabulary formation in the Movie-Lens system how different design choices affect the nature/types of tags used, their distributions and the convergence within a group.

In order to define the facets, data models or ontologies are needed. The most important initiative to define a “framework” for the tagging of fiction films is proposed by Geisler et al., (2011), which enables both “fans” and scholars to create detailed indexing terms at different granularity levels. It is this focus on creating data models for “guiding tagging” what makes *crowdsoucing* and *nichesourcing* be related (§§1.2,2.5). Also, as Good, Tennis, & Wilkinson (2009, p. 14) point out, investigation on methods for guiding user contributions in particular directions is an important area of tagging behavior research.

In the experiment we describe here, guidance is provided to some of the taggers in the form of an instructional text that was used to inform the randomly selected participants on which types of tags they should use (see under section “user instructions”).

5.3.5. Tag categories

Although there is active research on tag categories (Peters, 2009, p. 196), to our knowledge, there are no studies about the different types of user-generated tags in a time-based fashion within the audiovisual domain. The only precedent seems to be Golbeck et al., Golbeck, Koepfler, & Emmerling (2011), who applied the Panofsky/Shatford matrix to the analyses of social tagging behavior of image content. They tried to discover the relationship between tagging behavior and the features of the media being tagged, that is, of the image types. And in the visual domain, the work by Gligorov et al., (2011) who applied the matrix to the analysis of time-based tags in the *“Waisda?”* game, which this study is a continuation of.

In the cultural heritage sector there are related controlled vocabularies created by art or film institutions for cataloging their holdings or to provide cataloging tools: for instance the Library of Congress Thesaurus for Graphic Materials, the Getty Art & Architecture Thesaurus, the standardized metadata schema VRA Core (a data standard for the description of works of visual culture as well as the images that document them), or the International Federation of Film Archives (FIAF) thesaurus for film materials (§2.3.2.3). However, there are two characteristics of these controlled vocabularies that may impede their use for tag recommendation or alignment with socially generated tags in a time-based annotation setting: they are used mostly by indexing experts, and they are used for describing the video as a whole, with no evidence that this can be done likewise on a time stream basis. Other indexing alternatives different to thesaurus-based indexing (e.g., by using shooting scripts as textual sources that can be used for obtaining time-based data) are investigated (e.g., Turner, 2009).

There is also related work in the metadata standards realm, mainly in the use of textual annotations at the shot level proposed by the MPEG-7 standard. This standard “provides also

a tool for more structured textual annotation by including specific fields corresponding to the questions "Who? What object? What action? Where? When? Why? and How?" (Martínez, 2004). However, there is no evidence of research about how annotations at this level and in these facets are obtained in practice.

In our study, with the aim of creating an instructional guide on tag types for film content, and for observing the semantic categories and types of tags used by the experts and novices groups, in addition to the Panofsky/Shatford matrix, and Hollink's model (§2,8.3), we selected four types of tags by combining different models for fixed image analysis found in the literature (§2.8.3) in order to provide guidance during the tagging activity. The selected categories are detailed in the data analysis section of this chapter (§5.4.7).

5.4. Study Design

This section relates to the theoretical framework proposed in Chapter 3 (§3.5.2.2), which depicts the elements and relations involved in a tagging activity from an IS&R framework when tags are created through an interface. The "actor dimensions" (§3.6.1) are the most important ones, including: his/her declarative knowledge and procedural skills, their perception of the "work" task (a game in this case), and the perceived annotating tasks (the actor's perception of the tagging task including the perceptions and emotions of the task performance).

The following sections explain the study design, according to the research terminology used in this thesis (§4.2).

5.4.1. Method

For approaching our research questions, we designed a small-scale experiment using the *"Waisda?"* video labeling game, in which both film experts and novices performed time-based tagging for five film clips.

For addressing the two research questions mentioned above, we designed a 2 × 2 between-subject study for which we selected two groups of participants: film experts and novices. These groups were in turn divided into two sub-groups: one having instructions (guidance in which types of tags they could use), and the other one having only general indications on how to play the game, but no instructions on the types of tags to enter. Every participant that agreed to be part of the experiment received an email with the general indications on how to play in *"Waisda?"*, and half of the participants received additional instructions on the type of tags to use. The specific purpose of the experiment (that is, to know the difference in the tag types used by experts and novices) was not announced in the call.

All participants were asked to play a game with each of the five videos. Since we were interested in the types of tags, they were allowed to use their mother tongue when tagging if it was one of English, Dutch or Spanish with the aim of favoring their spontaneity. The

participants were asked to fill in a questionnaire after completion of the five games.

5.4.2. Selection of participants

In total 36 persons participated in this study: 18 film experts and 18 novices, 9 out of the 18 in each group received instructions and 9 did not. The participants were selected in two different ways:

The film experts. We considered people who are somehow involved at a professional or academic level with film content and linked to film related institutions. Our participants were contacted in film and television archives, universities, a government institution, and at a national library's film archive. They were based in The Netherlands, Norway, United States, Spain, and Colombia. In total, 45 invitations were sent, and 18 experts completed the full experiment (response rate: 40%). This group included participants who were film historians (scholars), cataloguers or archivists (curators), filmmakers, film/video technicians and film programming staff. All of them had an academic background in and/or formal education related to cinema. Regarding their ages, twelve experts were between 30 and 39 years old, three were between 50 and 59, two between 20 and 29, and one between 40 and 49. Of these participants, half had working experience with film materials and content of 10 years or more (n=9); between 7 and 9 years (n=6), 4 to 7 years (n=2), and one was a junior researcher (less than 3 years of working/research experience). There were twelve females and six males.

Film novices. As non-experts, we considered people without a professional or academic relation to film content, and people not familiar with terminologies related to film. They were recruited by using an informal call for participation on one of the author's Facebook pages, indicating that the only requirement to take part was not to be a film expert or enthusiast. In total, we got 26 positive replies. From those, 18 completed the full experiment.

The novices group consisted of professionals with high-level education, mainly with a Library and Information Science background. This indexing expertise factor was not intentionally sought in the study, but since we were interested in domain specific knowledge we did not consider it a problem, rather we saw it as an advantage, since it helped us have a higher number of participants in all groups with knowledge and experience with tags and keywords. Regarding their ages, most novices were between 30 and 39 years old (n=9), the others were between 20 and 29 (n=5), 40 and 49 (n=2), and 50 and 59 (n=2). All novices defined themselves as such, that is, their domain-specific knowledge or distinct concern about films was null, and their interest in them was not explicitly reported to go beyond occasional movie-going activities. There were fourteen females and four males.

5.4.3. Prototype application

We used the *"Waisda?"* system[(rw)] for the experiment setup. This is available as free and open source software at the GitHub repository[(rw)]. Figure 1 shows a screenshot of the tagging interface where it is possible to see how tags are entered while the video plays, being

attached to a specific time point in the video. Users get points by entering tags, and a higher score when the tags match with the tags entered by other participants, as it can be seen on the right side, in the case of the tag “long shot”. A detailed explanation of the software, game rules, and the interface is described by Hildebrand et al. (2013).

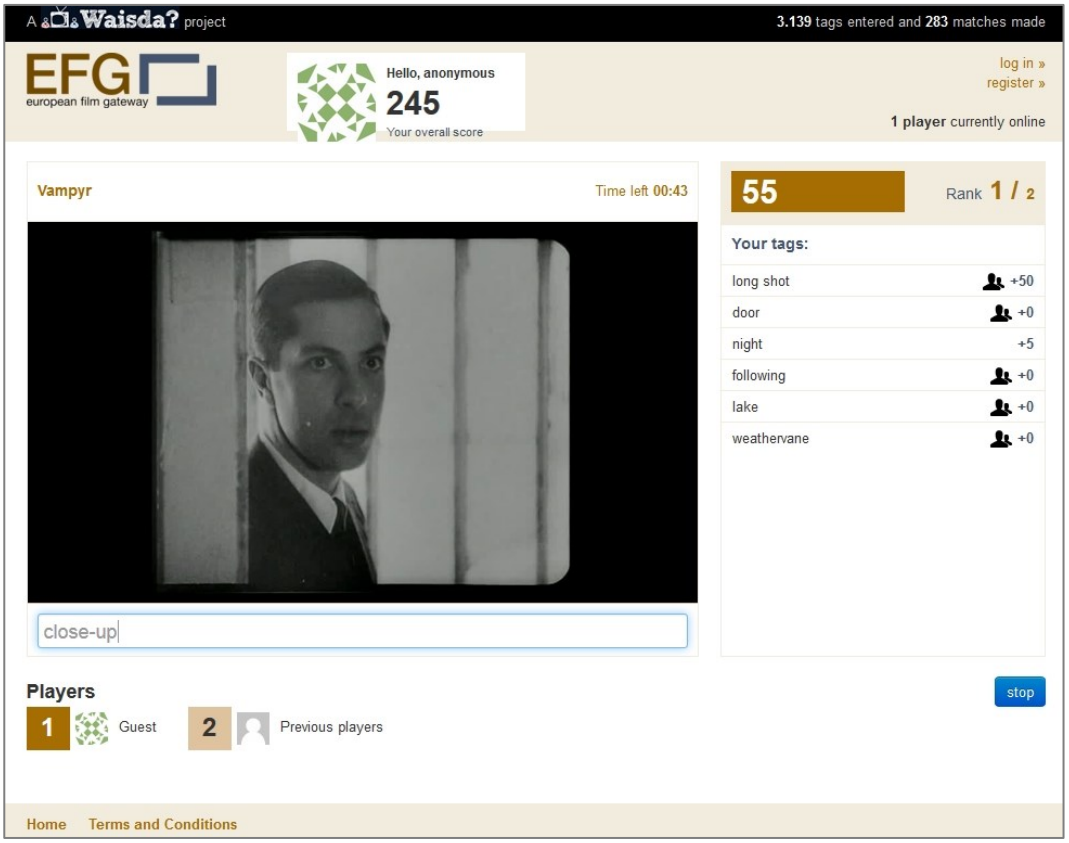


Figure 5.1. Waisda-EFG tagging interface snapshot

For the experiment, the functionality of *“Waisda?”* was modified in two ways. Firstly, we neutralized the effect of the game scores on the tagging behavior, that is, score was not given when the tags entered by one participant matched with tags entered by other participants, since when participants compete against each other, they might be encouraged to enter the types of tags that will maximize their score. For example, if a player observes that by entering “woman”, (s)he is rewarded with points, then (s)he would be encouraged to enter other tags of that type, such as “man”, “dog”, etc. This is what Fu, Kannampallil, Kang, & He (2010) called “semantic imitation”, where “users who can see tags created by others tend to create tags that are semantically similar to these existing tags”. Semantic imitation is an important characteristic of tagging games, but for the purpose of our experiment it had to be neutralized. As a solution, we decided to retain the scoring mechanism of the game, but to control the tags that are rewarded with points, in order to guarantee a fair distribution over the different tag category types (these categories are explained later in the “user instructions” section). Therefore, we introduced a single non-real player (a bot) that all the participants competed against. Since the bot functionality was identical for all participants, its

influence is the same for all subjects. The players were rewarded points for matching with tags of the bot but were unaware that they were not competing with other players. For each of the five film clips, we created a set of tags for the bot that covered each of the five tag categories included in the instructions. In this way, participants were rewarded when they entered matching tags in any of the different categories, and not only for factual tags, which we knew from previous *"Waisda?"* experiments would be the preferred type of tag by the participants.

As a second modification, we disabled the display of tags entered by other players in the *"Waisda?"* game, in order to neutralize all tag suggestions other than the instructions of the experiment. For this purpose, we deactivated the tag cloud with the most popular tags that are usually shown on the original *"Waisda?"* homepage.

5.4.4. Selection of film clips

We uploaded five clips from the European Film Gateway (EFG) [(rw)] into the system. The EFG is a portal that gives access to the digitized collections of around sixteen European film archives and cinémathèques. We made a purposive sampling by selecting five clips according to the following criteria:

The clips should be from films with no dialogs, because we wanted to focus initially on exploring moving image tagging (avoiding script transcription as much as possible);

The clips should be of a short duration (no longer than five minutes), as previous *"Waisda?"* studies had indicated that the players prefer playing games with short clips. Also, we wanted to minimize the time needed for the experiment.

Except for a Swiss short film, our final selection included movies from renowned Danish and German film classics or directors; we also assumed that if these movies were presented at the EFG their value was previously assessed. The five selected film clips were (clip duration is between brackets, more information can be found in Appendix G): "Den flyvende cirkus" (Alfred Lind, Denmark, 1912; [02:02]), "Die Gezeichneten" (Carl Th. Dreyer, Germany, 1922; [00:37]), "L'aiguille" (William Piasio, Switzerland, 1961, [05:55]), "Metropolis" (Fritz Lang, Germany, 1926, [01:30]), and "Vampyr" (Carl Th. Dreyer, Germany/France, 1932, [01:36]).

5.4.5. Participants' instructions

All participants received a common set of instructions by email (Appendix D), indicating how to play *"Waisda?,"* also available on the Waisda/EFG homepage created for the test (§5.4.3). Participants that were part of the "instruction group" received another set of instructions, with details on the types of tags they could use (see "*Classification No.1*" in the "Data analysis procedures" section). We created a simple "instructional model" based on some features of the models described in the section "tag categories and models for image description". The following were the resulting instructions that we provided to the participants:

> "Tags consisting of one or two words are more likely to match than longer phrases. Tags may be about the following aspects (please try to cover as many as you can during the game):
>
> *Facts*. What you see or hear in the scene, such as objects, persons, places and actions (e.g. woman, sofa, London, R2D2, murder).
>
> *Cinematography*. Stylistic features, such as form, style, framing, camera movement, lighting key, type of shot, camera angle (e.g. backlighting, wide-angle, close-up, fade-out, caligarism).
>
> *Explanations*. Symbolic interpretation of the meaning or theme (e.g. psychotic rage, oppression, dehumanization).
>
> *Emotions*. The emotions, thoughts or intentions of the characters (e.g. bored, happiness, despair) or your own emotions (e.g. boring, fascinating).
>
> *Other*. You can use other types of tags that are not described here".

We didn't intend to create a "new" model or set of categories in this text, but rather interpreted and summarized some of the important features pointed in the existing models for image analysis related to film content. For instance, the *"Facts"* category, is inspired by Panofsky-Shatford's 'pre-iconography/ generic 'of' and Iconography / specific 'of'', and in Baca's (2002) "ofness" categories. Our *"Emotions"* concept coincides with Panofsky's (1939) 'Pre-iconographic (expressional) category' and other models which consider emotional abstraction (Burford, Briggs, & Eakins, 2003; Eakins, Briggs, & Burford, 2004). Our "Explanation" type was derived from Panofsky's (1939) "iconology" category and Ingwersen's (1992) "aboutness," and our *"cinematography"* type from Hollink, Schreiber, Wielinga, & Worring's (2004) "perceptual" category and from one of the key books on cinematography (Bordwell & Thompson, 2003).

5.4.6. Questionnaire

The participants were asked to fill in a questionnaire after completion of the test (Appendix E). The questionnaire consisted of 22 questions, divided into three sections: demographic information and expertise level; previous experience with indexing, tagging and labeling games; and the participant's experience with the game and experiment. In this last set of questions, participants were asked to rate their level of difficulty in coming up with tags, the influence that scoring in the game had on their motivation, the usefulness of the instructions, and their perception of the value of their tags for future use. The participants were also asked to select the types of tags (factual, emotional, etc.) they used, according to their own judgment. There were also open questions in which participants could write their comments about these different aspects.

5.4.7. Data analysis procedures

We omitted tag stemming procedures since we are mainly interested in the type of tags that were entered, and not in the matching tags or tags morphology. All tags entered in Spanish

and Dutch were manually translated into English, and misspellings were corrected, only with the aim of facilitating the tag category analysis[70].

In the quantitative analysis of the tags, we consider the number of tags that were entered. In this experiment, we do not include precise quantitative results of matching tags, due to the presence of tags in different languages. In the semantic analysis of the tags, in order to analyze their types, we manually classified them according to four different tag classifications (*Classification No.1* corresponds to the instructions given to the participants, while Classifications No.2 to 4 were used for complementing the analysis but were not provided to the participants. In these last three classifications, we followed the same approach as in Gligorov et al. (2011)):

- *Classification No.1:* ***Instructional model*** (*"facts", "emotions", "explanations", "cinematography", "other"*). For the criteria to classify a tag in these categories, we used the examples and descriptions given to the participants, and we added some criteria for classifying the data.
- *Classification No.2:* ***Hollink's model*** (*"non-visual", "perceptual", "conceptual"*). This classification was used as in Gligorov et al. (2011). It includes the "non-visual" level (descriptions that are meant to describe the context of the video but not its content); the "perceptual" level (tags that are derived from low-level audio and visual features of the video); and the "conceptual" level (tags that describe the content of the image, giving information about the semantic content of the image). We only use this classification to filter out the conceptual tags.
- *Classification No.3:* **Panofsky's categories** (*"specific", "abstract", "general"*). As used in Gligorov et al. (2011) is used here. At this level, tags that were classified as conceptual are classified according to their specificity level into specific, abstract or general. *"Specific"* (iconography) tags possess the property of uniqueness, for example, the name of a person or place. *"Abstract"* (iconology) tags are those which level of subjectivity allows for differences in opinion, for example, "crazy woman" or "difficult rescue." We included here tags expressing relationships (friends, father, daughter), or tags related to occupations or professions that can give room to discussion (thief, artist, acrobat). The last category in this classification consists of *"General"* (pre-iconography) tags, which can be derived from the visual properties of the image or sequence alone. As we found later in the analysis, tags classified as General do not have to be correct (for example, to the same part of the video, some users assigned the tag "dog barking", and others "duck quacking", this low level of subjectivity is not enough to consider the tag Abstract).
- *Classification No.4.* ***Shatford's categories*** (*"who", "what", "where", "when"*). We used the concepts from Shatford Layne's concepts (Layne, 1986): a tag is in the *"who"* facet if it refers to the concrete objects and beings, animated or inanimate; or individually named

[70] The data is made available online in anonymized form at via a Github repository[(rw)].

> persons, animals, things; or to kinds of persons, animals, things; or to mythical beings, abstractions manifested or symbolized by objects or beings. A tag belongs to the "*where"* facet if it refers to a location, and to the "*when"* facet if it refers to time. A tag is associated with the *"what"* facet if it refers to an event in the video: "what are the objects and beings doing? (action, events, emotions)", explains Shatford.

The combination of *Classification No.1 and Classification No.2* results in the so-called "Panofsky-Shatford matrix," shown in Figure 2.6. The tags were manually classified according to each classification above by one of the authors. In order to assure the consistency of the classification criteria, a sample of the tags was classified by a second person. We used a quota sample by randomly selecting tags created by each of the four subgroups for each video. The Cohen's kappa $(k)^2$ was used as a measure of agreement between both annotators. The results were reasonable for three of the classifications (0.67 for classifications 1 and 2, and 0.62 for classification 3). The agreement was low (0.32) for classification 4. However, more in-depth analysis showed that this was due to a different interpretation of the Panofsky-Shatford's model in relation to the "Who" and "What" categories: in the original Shatford (1986) model, both objects and subjects are included in the "Who" category, while the "What" category is reserved for events. The second evaluator followed the interpretation from Gligorov et al (2011, p. 150) which defined that only main *subjects* of the video (persons or objects) fell into the "Who" category, while events or any other object that was not the *subject* of the video, went into the "What" category. This doesn't reflect a disagreement in the tags classification but a different interpretation of the model. Since it was applied systematically in the classification of a small proportion of tags, we concluded that the categorization was consistent and not arbitrary and that we could use it for analyzing our results.

After tag classification procedures, we manually clustered synonyms and singular/plural forms to look at the most frequent types of tags from a semantic perspective (the tags obtained from these clusters were used in Figure 3, 4 and Table 3).

Finally, to understand how the participants experienced their own tagging experience and the *"Waisda?"* game, we analyzed the answers to the questionnaire and used some of them to help interpret the results of the quantitative and semantic analysis.

5.4.8. Limitations

It is important to notice that the data collection took place in a game setting, which may be a very specific type of tagging scenario. However, even though this study did not include a comparison between the differences in non-game contexts, most of the findings were in line with conclusions found in other experiments based on other data collection methods.

In relation to homogeneity in the experts and novices groups, we learned that future studies of tagging behavior should refine procedures for detection and/or operationalization of expertise by testing the actual knowledge of the participants (as it is done for instance in Kang

& Fu, 2010). In our test, we relied on other less systematic mechanisms, as described in section "selection of participants". Additionally, we omitted any form of control in the participants who got the instructions to know if they read them in detail. At least one participant admitted having skipped a careful reading.

In relation to the labeling setting, we chose to let participants play against a bot, instead of the default setting: against each other. Influence in tag selection by the participants is, in both cases unavoidable and difficult to judge or measure.

Additionally, one challenging aspect was the presence of different languages in the tags and their subsequent translation. We find the procedure of allowing taggers to use their mother tongue valid for our research purposes and tried to neutralize the effect of real scoring by introducing a 'bot' with random multilingual tags. In real tagging scenarios, multilingualism is far from being a trivial issue and a research area on its own that we did not touch in our study in detail.

Finally, this was a small-scale experiment that counted with the participation of the minimum number of film experts and novices (45 cases per group: 5 videos x 9 participants). A higher number of participants would be needed to validate the findings quantitatively.

5.5. Findings and discussion

This section presents the findings to this study's research questions (§5.2), as follows: first, the analysis of the number and types of tags created by the scholars (*RQ1.1*, and *RQ1.2,* §5.5.1). Next, a series of tagging behavior factors that emerged from the participants' questionnaire answers about their perceptions of their tagging behavior, and in relation to the game setting (*RQ1.3*, §§5.5.3-5.5.7).

5.5.1. Number of tags

The 36 participants contributed a total of 2,943 distinct tag entries for the five videos. 2,404 were in English, 262 in Spanish, and 276 in Dutch. From the 2,404 English tags, 1,137 were unique. Table 5.1 shows the means and standard deviation of the tags entered by each group. The high standard deviation among the participants in the novices without instructions group (58.1) was due to the presence of one "super-tagger" (as called by Trant (2009b)). However, we did not detect any outliers (using the outlier labeling rule with a value of 2.2 as the multiplier).

A Kolmogorov-Smirnov test showed that tags per group and video were not normally distributed. We therefore chose to conduct a Kruskal-Wallis test (a nonparametric test for independent samples and three or more groups) to examine the relationship between number of tags, expertise and instructions among all groups as well as a Mann–Whitney *U* test for testing differences between pairs of groups.

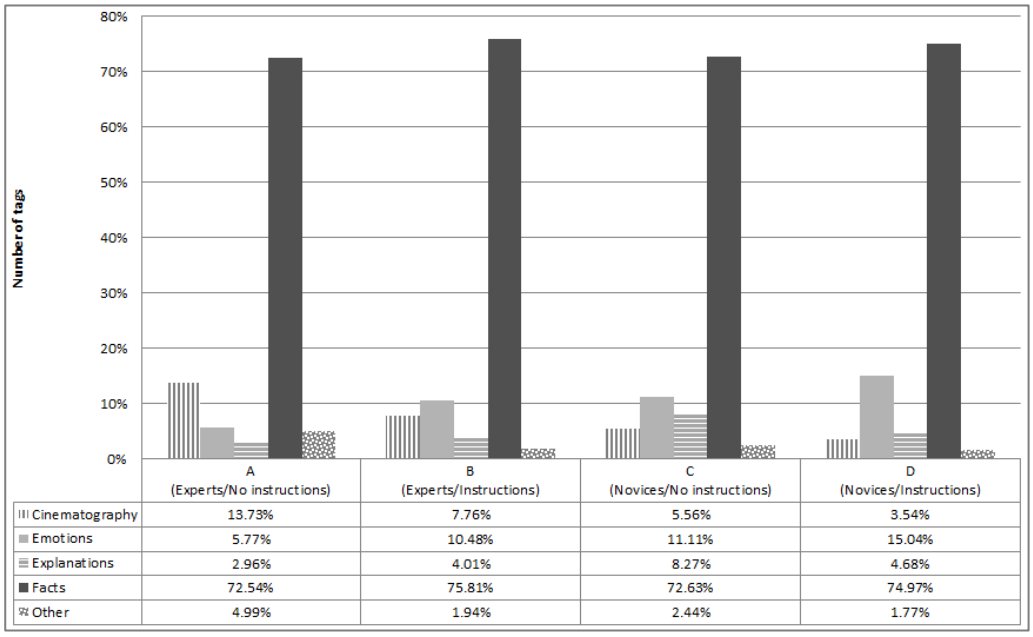
Table 5.1. Descriptive statistics of the number of tags per group (5 film clips, total duration: 700 sec.).

Group	N	Total tags	Mean	Median	Min	Max	Standard deviation
A. Experts/ No instructions	9	641	71.2	66.0	27	140	40.9
B. Experts/ instructions	9	773	85.89	77.0	48	140	28.17
C. Novices/ No instructions	9	738	82.0	61.0	23	193	58.1
D. Novices / instructions	9	791	87.9	88.0	55	150	31.0

The results showed that, in most cases, there is no effect of expertise and/or instructions in the number of tags entered by the different groups (p> 0.05). One exception appears in the evaluation at the individual video level, for which there was a significant difference for the clip of "Metropolis": i) in the number of tags entered between all groups (p= 0.013); ii) between the groups A and C (experts and novices no instructions) (p= 0.019); and iii) between the groups B and D (experts and novices with instructions) (p= 0.024). We will comment on this later.

5.5.2. Types of tags

To observe the types of tags among the different groups, we used the first classification (Cinematography, Emotions, Explanations, Facts, Other). As we can see in, the distribution of the types of tags among the different groups shows that all of them predominantly entered factual tags.



	A (Experts/No instructions)	B (Experts/Instructions)	C (Novices/No instructions)	D (Novices/Instructions)
Cinematography	13.73%	7.76%	5.56%	3.54%
Emotions	5.77%	10.48%	11.11%	15.04%
Explanations	2.96%	4.01%	8.27%	4.68%
Facts	72.54%	75.81%	72.63%	74.97%
Other	4.99%	1.94%	2.44%	1.77%

Figure 5.2. Proportional distribution of tags types across different categories (Classification No.1) *(Percentage in relation to the total tags per group)*

To illustrate which tags belong to each category, Table 5.2 includes the three most frequent tags per group**.**

Table 5.2. Three most frequent tags in each category of Classification No.1 per group.

Categories	A (Experts/ No instructions)	B (Experts/ Instructions)	C (Novices/ No instructions)	D (Novices/ Instructions)
Cinematography	silent film; black and white; fiction	silent film; black and white; close-up	black and white; silent film; drama	black and white; silent film; close-up
Emotions	mystery; danger; fear	danger; help; angry	old; pain; scary	fear; relief; anger
Explanations	rebellion; expressionism; dystopia	expressionism; death; poverty	death; impressionism; luck	lucky; death; menacing music
Facts	door; train; smoking	shadow; smoking; monkey	shadow; workers; train	shadow; monkey; bell
Other	film; dreyer; german	german; vampyr; early cinema	german; vampyr; italy	german; metropolis; french

Factual tags correspond to objects or actions that are depicted in the scenes. These "ofness" words (Baca, 2002; Layne, 1986; Peters, 2009) correspond to what Panofsky calls the "pre-iconographical" level of meaning: the description of "primary or natural subject matter", which is apprehended by identifying *pure forms* (Panofsky, 1939, p. 5). Even though object identification is not a simple process (from the semiotic point of view), it is assumed here that these descriptions do not require film domain specific knowledge. Through other research methods, researchers have found similar results related to the annotation of moving images at the shot level by film professionals, showing that indexing and non-indexing experts select "ofness" terms rather than "iconographical (aboutness)" terms (Turner, 1994, 1995, 2009)[71].

To examine closer what happened in the other four tag categories, and for observing the effect of expertise and instructions in the distribution of the types of tags, we performed a Kruskal-Wallis test again, for testing differences among all groups, and a Mann–Whitney *U* test for testing differences between pairs of groups. Table 5.3 shows the cases in which we found a statistically significant difference ($p < 0.05$).

In Table 5.3 we observe that there is a significant difference in the use of tags of the type "Emotion" between all groups, and by almost all the analyzed pairs of groups. This result was

[71] In Turner 1994 and 1995 study, the participants were recruited and classified according to "visual literacy," that is, paying attention to whether a person was "visually-oriented" or "non-visually oriented." And also to the level of "training" in the visual domain, by having a related occupation to that medium, e.g., film director, film editor, artist, photographer, audiovisual producer, and professor of film animation. Turner's main participants in the "visually-oriented" group were recruited from the film industry and from a university film studies programme. The non-visually oriented participants were recruited from other organizations. In that sense, the findings can be related, since there are correspondences with the types of participants included in our study.

not expected. The group of experts with no instructions (A) had significantly fewer tags of the type *"Emotions"* than the respective novices group (C) (5.77% vs. 11%, *p*=0.003), and that the groups with instructions (B and D) entered more tags of this type than their counterpart with no instructions (A and C) (5.77% vs 10.48%, *p*=0.024 for the experts groups, and 11% vs 15%, *p*=0.031 for the novices groups).

Table 5.3. p-values from Kruskal-Wallis and Mann–Whitney U test considering the five film clips.

Cells in grayscale indicate a statistically significant difference at the p<0.05 level.

	All groups (A, B, C, D)	**Experts (No instructions/ Instructions) (A and B)**	**Novices (No instructions/ Instructions) (C and D)**	**Experts and Novices (No Instructions) (A and C)**	**Experts and Novices (Instructions) (B and D)**
Cinematography	0.102	0.340	0.161	0.387	0.024
Emotions	0.001	0.024	0.031	0.003	0.113
Explanations	0.338	0.931	0.050	0.136	0.666
Facts	0.498	1.000	0.190	0.605	0.666
Other	0.383	0.222	0.387	0.436	0.546

An explanation for the significant difference in the use of tags of the type "Emotion" shown in Table 5.3 is that it is caused by the level of awareness that the instructed groups gained on this type of tag. *Emotional* tags correspond to feelings expressed by the characters in the scenes as detected by the taggers (e.g. 'angry'), or to feelings experienced by the tagger her/himself (e.g. 'creepy'). The last type coincides with what Zollers (2007) identified as "opinion tags".

Normally, the use of emotional attributes is not prescribed by traditional cataloging or indexing guidelines. However, there is growing interest in the structured identification of emotional aspects from various art forms. For instance, Winoto & Tang (2010) investigated how user mood influences the ratings given to movies, and how these ratings influence recommender systems. These authors identify a gap in research about emotion-based movie recommendations. In turn, Mühl (2012) used emotional tags from an online music streaming service in order to select clips for a study on inducing affect stimuli in a non-intrusive way. On a practical level, novel experiences such as the "Emolab" at the Frans Hals Museum in Haarlem, The Netherlands, use software applications to detect emotional identification by museum visitors with emotions expressed in paintings[(rw)].

Affective tagging could serve the purpose of both user engagement and retrieval based on non-factual information. For instance, Inskip, MacFarlane, & Rafferty (2008) describe the process of searching for accompanying music to film scenes, which involves highly subjective affective meanings, where *emotional* tags could be useful. In turn, there is active research in the psychology domain (Bálint & Kovács, 2012) and in film studies (e.g., the project "Emotions in Film" at the University of Amsterdam[(rw)]) about the emotional involvement of the film viewer, which require or benefit from this type of tagging. Likewise, Knautz and Stock (2011)

also indicate that there is a new research area called "Emotional Information Retrieval" (EmIR). These authors contributed to this area by investigating users' tagging of YouTube videos based on a controlled vocabulary of nine basic emotions, finding high consistency of the users' terms in this area.

In Table 5.3 we can also observe a predictable result in relation to *Cinematographic* tags between groups B and D (experts and novices with instructions). There was a significant difference (p= 0.024) in the number of tags entered by experts with instructions (B) in relation to novices with instructions (D) (7.76% vs. 3.54% of each group's total tags, as it can be seen from the proportions in Figure 5.2. ***Cinematographic*** tags correspond to domain-specific terms, such as photographic aspects of the shots or framing, camera movements or editing characteristics. In relation to our first research question, on whether experts' tags reflect their specific knowledge, we expected that the lack of domain-related knowledge made it difficult for novices to describe their cinematographic aspects and that this type of tags would be more used by experts. Unexpectedly, novices also used this type of tags, but in a more general fashion than experts did (for instance, as shown in Table 5.4, by using tags such as 'black and white', or 'silent film'). In relation to our first question, about how experts and novices' tags differ, Table 5.4 confirms an important distinction, which is the experts' variety of domain-specific terms in relation to cinematographic language. These terms are located in the long-tail portion of the expert tags' distribution and are thus not quantitatively significant, but semantically rich from a qualitative perspective.

We explored the semantic overlap of this tags' sub-set with The International Federation of Film Archives (FIAF) thesaurus (offered at their "FIAF subject headings" website)[(rw)], looking for similarity (syntactic and semantic) between the sample of tags in Table 5.4 and the thesaurus descriptors. From the 77 Cinematography tags, only 10% (n=8) had an exact equivalent (syntactic and semantic); 32% (n=25) had some sort of equivalent in the thesaurus (e.g. for the tag 'silent film' the equivalent would be "history of cinema. silent period"; for the tag 'parallel cutting' the equivalent would be a more general term such as "Cutting"). None of the tags indicating shot type was found in the thesaurus, where the broader terms "Camera angles" or *"Cinematography"* cover all the spectrum.

However, we assume there are richer semantic connections within the tags themselves, and not only in relation to external vocabularies that do not have a time-based focus. In this sense, a relevant topic for future work is mining the semantic associations between tags and tag provenance in relation to the time dimension. For example, within a 10-second span, we can have a combination of expert and novice tags such as 'abandoned', 'house', 'panning'. If the tag 'panning' was added by a film expert, this could eventually indicate that there is a pan shot of an abandoned house in that time frame.

Table 5.4. Cinematographic tags used by experts and novices

Groups combined (respectively A+B; C+D), including tags in the long-tail portion of the total tags' distribution, considering the five film clips (numbers in parenthesis indicate frequency).

Cinematographic tags (sub-type)	**Expert tags' frequencies** (n=) **(Groups A+B)**	**Novice tags' frequencies** (n=) **(Groups C+D)**
Acting	extras (1); silent film actress (1)	
Copy	restoration (1);	poor picture quality (1)
Editing	rapid cutting (1); parallel cutting (1); reverse (1); editing (1); continuity editing (1);	continuous (1) ; fadeout (1)
Genre	silent film (mute cinema, mute pictures, silent, silent cinema, silent movie, silent movies) (25); fiction (4); thriller (3); sound film (2); trailer (2); horror (2); drama (2); documentary feel (1); science fiction (1); melodrama (1)	silent film (mute cinema, mute pictures, silent, silent cinema, silent movie, silent movies) (25); fiction (1); thriller (1); horror (1); drama (3)
Mise-en-scene	exterior shots (3); interior shot (interior scene) (3); interior (2); decor (1); set design (1); setting (1)	
Narrative	intertitle (7); titles (4); credits (4); intro (2); climax (2); German intertitles (1); end title (1); title card (1); epilogue (1); narrative (1); end (1)	titles (1); end (2); start (1); subtitles (1); sequence (1)
Shot type-framing	close-up (6); long shot (4); high angle (3); camera pan (2); subjective shot (2); shot on location (1); pan shot (1); fear in close-up shot (1); deep focus (1); detail (1); diagonal (1); panning (1); point-of-view (1); crane shot (1); close up interior shots (1); offscreen (1); extreme long shot (1); topshot (1); low angle (1); aerial shot (1)	close-up (5)
Shot-photographic aspects	black-and-white film (black and white, black & white, black white) (10); superimposition (3); shadow theatre (chinese shadows, javanese shadows, shadowplay) (3); chiaroscuro (1); double exposure (1); vignetting on film (1); tableau (1); trick photography (1); silhuoettes (1); masking (1)	black-and-white film (black and white, black & white, black white) (22); shadow theatre (chinese shadows, javanese shadows, shadowplay) (1)
Technique-sound	offscreen sound (2); scored music (1); accompaniment (1); musical accompaniment (1)	

Coming back to Table 5.3, there does not seem to be any significant difference between the groups in the use of the tags of the type *Explanatory*. These tags range from the simple registry of objects and actions, to the higher level of abstract ideas, symbolic interpretations or interconnections (for instance, finding a relation with an art or literary movement, as in the

tag ‘expressionism’). These tags require from the tagger more effort in using her/his background knowledge, whether film related or not. In our test, both film experts and novices provided this type of tags to a low extent.

The ***“Other”*** category also lacks a significant difference. These tags mostly correspond to what in *Classification No.2* is categorized as “Non-visual” level. It covers descriptive metadata such as the date (e.g. ‘1912’, ‘1932’), location or country of origin (‘french movie’, ‘german’), creator (e.g. ‘Dreyer’, ‘Murnau’), title (‘metropolis’, ‘vampyr’), or historical-contextual aspects (e.g. ‘early cinema’, ‘talkie’).

Following the procedure used in Gligorov et al. (2011), we used *Classification No.2* (Conceptual, Perceptual, Non-visual) to filter out only the conceptual tags for the subsequent Panofsky-Shatford analysis (classifications No.3 and 4). Tags classified in this category (Conceptual) corresponded to 86% of the tags’ total (coincidentally this proportion is almost the same one found by Hollink (2006), who concluded in her empirical study about the use of the different categories in her model –our *Classification No.2*- that the conceptual levels were used most (87%)). Table 5.5 shows the proportions of conceptual tags in each of the Panofsky/Shatford categories.

In relation to our first research question, about the differences between experts and novice’s time-based tags, the figures in Table 5.5 confirm our previous finding about the lack of substantial dissimilarities in the most common chosen semantic types of tags by both groups. In this case, both experts and novices used more tags of the type “General/Who”, with no significant statistical difference between groups. This category corresponds mostly to factual tags and more specifically, to descriptions of objects in the scenes. This result agrees with Thøgersen (2013) who found in his study about fixed image tagging by general users that most tags were of the type “Artifact/objects.” After this category, tags in the “General/What” category predominate; these are descriptions of what happens in the scenes at a general level (e.g. ‘bell ringing’). “Abstract/What” tags were the third more used type by both groups, which corresponds to descriptions of events or actions in the scenes at an abstract level (e.g. ‘calamity’). In this category, there was a statistically significant difference between groups A and C (experts and novices without instructions).

Table 5.5. Proportional distribution of Conceptual tags across different categories per group (Classifications No.3 and 4: the Panofsky/ Shatford matrix).

(Percentage in relation to the total conceptual tags per group. Values in percentages)

Category / Group	A Experts/ no instructions	B Experts/ instructions	C Novices/ no instructions	D Novices/ instructions	Total
General/Who (e.g., man, bell, dog, animals)	48.16	40.27	35.64	32.59	38.54
General/What (e.g., bell ringing, children playing, hug, kissing goodbye)	23.21	23.03	21.19	31.07	24.88
Abstract/What (e.g., abandoned, bored, calamity, danger)	15.09	23.33	26.37	27.60	23.63
Abstract/Who (e.g., thief, proletarian, friend)	4.84	7.73	8.95	4.99	6.67
General/Where (e.g., inside scene, downstairs, bedroom)	3.09	2.97	2.04	0.83	2.16
Specific/What (e.g. German expressionism, music Marsellaise)	1.93	1.19	1.73	0.28	1.22
Specific/Who (e.g. Maria, Grot, Heart machine)	1.16	0.59	2.35	0.69	1.18
Abstract/When (e.g., old time, future)	0.77	0.45	0.31	0.97	0.63
Abstract/Where (e.g., home, deserted house)	0.39	0.15	0.94	0.83	0.59
General/When (e.g., night, daytime)	0.39	0.30	0.31	0.14	0.27
Specific/When (e.g., xx century)	0.77	0.00	0.00	0.00	0.16
Specific/Where (e.g., Germany)	0.19	0.00	0.16	0.00	0.08

As we see in Table 5.5, non-instructed novices (group C) tended to use more "abstract/what" tags than non-instructed experts (group A) (26.37% vs 15.09% respectively; *p=0.006* after a Mann–Whitney *U* test). These tags coincide with explanatory and emotional tags. Indeed, using *Classification No.3* alone (abstract, general, specific), we find a significant statistical difference between the groups of novices and experts without instructions (groups C and A), where the former used overall more abstract tags than the latter (36.58% vs. 21.19%; *p=0.031).*

Table 5.6. Proportional distribution of Conceptual tags across different categories per group (Classification No.3)

(Groups: A: experts/no instructions; B: experts/instructions; C: novices/no instructions; D: novices/instructions). Percentage in relation to the total conceptual tags per group. Values in percentages).

Category / Group	A	B	C	D	Total
General	74.76	66.72	59.18	64.63	65.88
Abstract	21.19	31.51	36.58	34.40	31.49
Specific	4.05	1.78	4.24	0.97	2.62

In relation to our second research question, about the effect of instructions in the tags' selection, we found that instructed experts (group B) tended to use more abstract terms than their counterpart group without instructions (group A). Indeed, this tendency is statistically significant (*p= 0.040,* from a U Mann-Whitney Test for groups A and B in the abstract category using *Classification No.3)*. This difference was due to the increased use of "General/Who" tags by the instructed expert group in relation to the non-instructed expert group (*p=0.031,* using values from Table 5.5). The experts' preference for general tags over abstract tags shows similarities with conclusions reached by Thom-Santelli, Cosley, & Gay (2010). In their study about the differences between experts and novices in a collaborative environment, they found that experts have a preference for objective tags. The preference for general tags in a video labeling game also agrees with Gligorov et al. (2011), who found that most conceptual tags were general (74%). In our test, percentages of abstract tags were higher (31% of the total conceptual tags) than in Gligorov's study (7% of the total conceptual tags). This difference may be caused both by the type of content (film in our study vs. television in their study) and/or by the guidelines given to the taggers, which included *"Emotions"* in the possibilities.

5.5.3. Perception of the value of instructions

Participants in the guided groups (B and D, which were provided with instruction on which types of tags they could enter) were positive about their usefulness in helping them to come up with tags. A number of non-instructed experts and novices (n=5) suggested that the categories that we used in the questionnaire to ask them rank the types of tags they used ("Facts", "Emotions", etc.) (q16) could have been used in the instructional text as guidance for which types to use. These reactions indicate that instructions about types of tags are necessary for time-based tagging. One novice commented in this respect: *"Since the exercise did not declare any purpose, I wrote everything that came in my mind." (Participant group C).*

Table 5.7. Frequencies of ranking on a 5 point Likert scale the usefulness of instructions during tagging.

(1=not at all; 5=extremely). Groups: A: experts/no instructions; B: experts/instructions; C: novices/no instructions; D: novices/instructions.

Groups (n=9)	q18.Perceived usefulness of instructions (categories)			
	Mode	Median	Min	Max
A	2 (n=4)	2	1	5
B	3 (n=3) 5 (n=3)	4	1	5
C	3 (n=6)	3	1	5
D	3 (n=4) 4 (n=4)	4	3	5

Table 5.7 shows that when asked about the value of the given instructions (q18)[72], the median from groups B and D is higher than for the non-instructed groups (A and C). A higher value of instructions was perceived among the novices group (D). Participants described in the open answers to the questionnaire several issues which can be summarized in these points: (a) taggers need to know which aspects or dimensions they should focus on during tagging; presenting several types of tags in the instructions may help, but the participant needs only one to keep the focus; (b) participants should have previous knowledge about the movies and clips (e.g., contextual or historical information, and information about the clip itself), as well as of the purpose of the tags they will enter; (c) term suggestions may help the tagger.

In relation to indicating the future (retrieval) purpose of the tags in the instructions, and explaining how the indexing mechanism works, participants said:

> "As obvious as it seems, for a person who is new to labeling, it would help to tell them as part of the instructions, think about words that would help you find this material later." (Participant group C); "in hindsight I would say that the tags I used were primarily very simple content based tags from "facts" & "emotions" groups. While I would have found it quite easy to add more tags from the "cinematography" group (framing/camera movement, etc.), I didn't as I didn't understand whether the tags were somehow time-linked to the sequence, and I was worried that they wouldn't be relevant/useful unless they were." (Participant group B).

This leads us to observe that (domain) experts are also aware of indexing and retrieval principles. Therefore, this mechanism may have to be explicitly stated in tagging activities in

[72] Questions are numbered "q1, q2,…" the complete questionnaire is in Appendix E.

the context of *"nichesourcing."*

5.5.4. The role of professional experience with indexing, tagging and labeling games

Lee, Goh, Razikin, & Chua (2009) showed that "the familiarity of users with the concept of tagging, the functionality of tagging systems, and the use of web catalogs has a great effect on the user's tagging behavior" (p.184). To observe these issues, we asked the participants to rate their level of professional experience with indexing/cataloging (q7), their familiarity with creating tags, words or keywords for online content (for example: labeling images in Flickr, or videos in Youtube, or bookmarks in Delicious) (q8); about their familiarity level with video search through keywords or tags (q9), and their knowledge and experience with video labeling games (q10).

Table 5.8 shows the frequencies in the participants' responses.

Table 5.8. Frequencies of ranking on a 5 point Likert scale different aspects of indexing expertise. *(q7: No=0; Yes=1; q8-10: 1=not at all familiar; 5= extremely familiar). (Groups: A: experts/no instructions; B: experts/instructions; C: novices/no instructions; D: novices/instructions).*

Groups (n=9)	**q7.**Cataloging professional experience (Yes=1/No=0)	**q8.Familiarity with creating tags or keywords**				**q9.Familiarity with video search through keywords**				**q10.Familiarity with tagging games**			
	Mode	Mode	Median	Min	Max	Mode	Median	Min	Max	Mode	Median	Min	Max
A	1 (n=6)	1 (n=3); 3 (n=3)	2	1	4	1 (n=4)	2	1	5	1 (n=7)	1	1	3
B	1 (n=5)	2 (n=3)	2	1	5	4 (n=6)	4	3	5	1 (n=4)	2	1	3
C	1 (n=6)	1 (n=3)	3	1	5	1 (n=3)	3	1	5	1 (n=7)	1	1	5
D	1 (n=6)	1 (n=3); 4 (n=3)	3	1	4	3 (n=4)	3	1	5	1 (n=7)	1	1	3

We did not find a statistically positive correlation between the number of tags entered by the participants and each one of these different aspects (using the Spearman's Rho two-tailed test). This may be attributed to the quite homogenous "indexing" expertise of our participants regardless of their domain expertise. We also observed that the participant who entered the most tags in the entire game reported no experience with tagging, no experience with cataloging, or with labeling games.

Additionally, one participant who reported good familiarity with tagging entered the tags in the form of "subject headings" (e.g. "animals in the cinema", a similar form of the Library of Congress subject heading: "Animals in motion pictures"). This leads us to be cautious about concluding that our study contradicts results from Lee et al. (2009), but rather that there may be a limitation in our testing mechanisms for tagging familiarity.

5.5.5. The influence of content, and familiarity with the content

As expected, the expert participants reported familiarity with some of the video clips, mainly with "Metropolis" and "Vampyr", and on a lower degree with "Den flyvende circus" (n=4). Table 5.9 shows the participants' self-reported knowledge of the experiment films.

Table 5.9. Frequencies of ranking previous knowledge of the test films, on a 3 point Likert scale. *(0=no previously seen and no knowledge; 1=either seen or some knowledge; 2=previously seen and had knowledge). (Groups: A: experts/no instructions; B: experts/instructions; C: novices/no instructions; D: novices/instructions).*

Groups (n=9)	**q21. Had you seen the scenes/movies that were in the game before? Did you have previous background knowledge about these scenes/movies?**														
Clip	**Den flyvende cirkus**			**Die Gezeichneten**			**L'aiguille**			**Metropolis**			**Vampyr**		
Scale	**0**	**1**	**2**	**0**	**1**	**2**	**0**	**1**	**2**	**0**	**1**	**2**	**0**	**1**	**2**
	n=														
Group A	7	2	0	9	0	0	9	0	0	0	1	**8**	3	2	**4**
Group B	7	1	1	9	0	0	9	0	0	0	2	**7**	4	2	**3**
Group C	9	0	0	9	0	0	9	0	0	5	3	1	8	0	1
Group D	9	0	0	9	0	0	9	0	0	9	0	0	9	0	0

We performed a Spearman's Rho two-tailed test for testing the correlation between familiarity with each film and its corresponding number of tags, either total or per each category from *Classification No.1*. There was a positive statistical correlation between the most familiar clip for all participants ("Metropolis") and its total number of tags (*r=0.442; p=0.007* from a Spearman's Rho two-tailed test for testing correlation between familiarity with each film and its corresponding number of tags for this clip), which indicates that a higher level of familiarity resulted in more tags. There is also a negative correlation between familiarity with this film and the use of emotional tags (*r=-0.461; p=0.005)*, which indicates that the more familiar the tagger was with this film, the less likely was to use emotional tags. This corresponds to our previous findings of a marginally significant difference in the number of tags at the video level for the clip of "Metropolis". In this case, the experts' groups entered more tags than the novices' groups, but those tags were not of the type *"Emotions"* or *"Cinematography"*, but "Explanations" and "Other". This may correspond to the experts' knowledge about the metadata attributes and interpretations of this movie (e.g., 'dystopia', 'Fritz Lang').

From the answers to the open questions of the questionnaire, it was also observed that familiarity with the content plays an important role in motivating the participant to tag (once (s)he recognizes to have seen the movie previously). It also allows the participant to

concentrate on tagging, and not on getting acquainted with a movie that is new for her/him. As one expert states:

> "There is always the difference between knowing a film and seeing it for the first time. The first time [you have] reactions on what you see, the second time is more intentional" (Participant group B).

Also, low familiarity with the content can limit the use of certain types of tags, as one expert explains:

> "As I wasn't familiar with the sequences, and the clips were very short, I found it quite difficult to provide "explanations" (symbolic interpretations of the meaning or a theme...) without knowing additional contextual information about the scenes that were presented. I imagine it would be helpful to have some textual description of the scene setting before you start, but this would require human intervention and wouldn't be very automation friendly. Perhaps longer sequences would be helpful." (Participant group B).

The influence of content preferences by the players was not analyzed in this study, but it was one important factor observed in the case of the first *"Waisda?"* studies (Baltussen, Brienkerink, & Oomen, 2010), which found that content seems to influence the specificity of the tags that are entered.

5.5.6. Game effect, scoring and tagging motivations

A common feeling among the participants from all groups was time pressure. They found that the short duration of the clips, or the impossibility to replay them, added stress to think of, or limited them to entering more tags, both during the video (because they were watching it and not entering tags) or at the end of the clip (tags for the last frames). One expert commented that this was not "a professional way of working".

Table 5.10. Frequencies of ranking on a 5 point Likert scale different aspects of tagging behavior*. (q12: 1=very difficult; 5=very easy); (q13: 1=not possible; 5= possible); (q15: 1=not at all influential; 5=extremely influential). (Groups: A: experts/no instructions; B: experts/instructions; C: novices/no instructions; D: novices/instructions).*

Groups (n=9)	q12.Difficulty in coming up with tags				q13.Possibility of entering all tags				q15.Influence of scoring in game motivation			
	Mode	Median	Min	Max	Mode	Median	Min	Max	Mode	Median	Min	Max
A	2 (n=3); 4 (n=3)	4	2	5	4 (n=5)	4	1	5	1 (n=3) 2 (n=3)	2	1	5
B	3 (n=3) 4 (n=3)	3	2	5	2 (n=3) 3 (n=3)	3	2	5	4 (n=3)	3	1	5
C	2 (n=4)	3	2	5	4 (n=4)	4	3	5	1; 2; 4; 5 (n=2)	3	1	5
D	2 (n=3); 3 (n=3)	3	2	5	4 (n=4)	4	1	5	4 (n=3)	4	1	5

From figures in Table 5.10, we can conclude that it seemed to be easier for the experts groups (A+B) to come up with tags than for the novices. Among the instructed experts group (B), there were participants dissatisfied for not being able to enter all tags that occurred to them. They explained that the lack of familiarity and short duration challenged them in this respect. Participants from different groups pointed to different negative issues related to the game influence. These include (a) "multitasking" (i.e. watching the video, thinking of tags, typing it in); typing skills (having to look at the keyboard); (b) the impossibility to synthesize in a single word or in a couple of words the concepts they had about the fragments, and/or to recall the technical terms referring to shot types and editing; (c) language issues and spelling.

The reaction to scoring and gaming elements (q15) are very personal, and we cannot conclude any relation to domain expertise. Some experts made positive comments about the game itself and found it fun. Both among the experts and novices groups there were few participants concerned for having few matching tags. Not surprisingly, we found a positive correlation between scoring motivation and number of tags (*r=0.406, p=0.014* after a Spearman's Rho two-tailed test). A drawback of this correlation, also identified by Thøgersen (2013), is that since the game is set up to reward players based on matching tags. This encourages most players to tag what is in the picture, rather than thinking about other possibilities.

Finally, as in other tagging activities, there should be a quality control and feedback mechanism that allows the participant to check the value of her/his tags. One novice said:

> "It was very easy to write a tag when it came up in mind. The only difficulty was in deciding if it was a "correct" tag, i.e. if the word actually made sense, or it was just an instinctive reaction to what I was seeing" (Participant group C).

We can conclude that clear guidance and objectives in the tagging activity, encouraging participants to use their specific domain knowledge, and a flexible tagging setting (not necessarily competitive), may increase the motivation in the tagging activity beyond scoring mechanisms. Future work should focus on investigating which rewarding mechanisms work better for experts. One direction is suggested in the study by Thom-Santelli et al. (2010), who points to innate experts' feelings of territoriality and "curation", which means that experts can have higher levels of participation due to ownership feelings in cooperative work that involves targets of their concern (e.g. museum objects).

5.5.7. Tags perceived utility

According to questionnaire data (Table 5.11), novices were more positive about the possible use of their tags for future retrieval of the videos than experts, who were mostly uncertain. Since we know that most novices had indexing expertise

Table 5.8), this may be an indicator of the attitudes towards tagging from both groups (indexing vs. domain expertise).

Table 5.11. Frequencies of ranking previous knowledge of the experiment films on a 3 point Likert scale.

(0=no previously seen and no knowledge; 1=either seen or some knowledge; 2=previously seen and had knowledge). (Groups: A: experts/no instructions; B: experts/instructions; C: novices/no instructions; D: novices/instructions).

Groups (n=9)	q20.Perceived usefulness of entered tags	
	Mode	Median
A	1 (n=4)	1
B	1 (n=6)	1
C	2 (n=8)	2
D	2 (n=6)	2

In the questionnaire answers, domain experts cast doubt on the tags' semantic value. They consider them very general and only related to describing what they saw in the images, without taking into account any context. For these experts, this does not correspond to describing the actual content of the film. For instance, one expert stated:

> "Even to me the few times I did a tagging game it resulted in describing what you see in the image: a train, a monkey, a clock, etc. What the film is about is difficult to capture in tags. This might be done, but then you would need more time after the clip ends to reflect a bit and then to enter some more abstract tags" (Participant group A).

Likewise, an expert explains:

> "My tags were very factual, about what you see in the image. If you want footage of a train, then you will find L'aiguille. If you are looking for a silent expressionist horror film, you will not find Vampyr with my tags" (Participant group A).

One more expert confirms the utility of her/his tags, but, as (s)he says: *"only for such purposes as stock video footage, but not for meeting thematic or content driven curatorial or research needs." (Participant group A).* Indeed, Turner et al. (2002) suggested that the first level (pre-iconographic) seems to be useful mostly for stock shot libraries.

This shows the need for more research in understanding the use of time-based annotations for research purposes, beyond footage finding. From the novices perspective there are other concerns, one novice commented: *"I guess moviegoers tend to select films based on the genre as well as actors/actresses and maybe directors involved with the film. I am wondering how social tagging plays a part in helping us decide which films to watch" (Participant group D).* Current practice is showing interesting directions in involving humans in creating keywords for movie recommendation for entertainment, such as the Netflix case described by Madrigal (2014). These practices have roots in cultural heritage curation, and film archives can benefit from them for dissemination purposes.

5.6. Conclusions and future work

The study presented in this chapter was guided by the following general broad research question (§1.2):

RQ1. *What characterizes film experts and scholars' **tagging behavior** and their attitudes towards tagging moving images? Are there differences and/or similarities between film domain experts and novices in their tagging behavior? Moreover, if so, what are these similarities and/or differences?*

The broad conclusions and implications related to that question are presented in Chapter 9. Next, the findings of this case study are summarized by each specific research question:

RQ1.1. *How do film experts tag films compared to domain novices? Do film experts, as opposed to domain novices, reflect their domain specific knowledge when tagging film content?*

Conc. A.1. Experts tag in a similar fashion as novices when participating in a tagging game. In general, they enter the same number of tags, and they mostly use *Factual* tags. However, in the experts' less-frequent tags, there are more domain-specific terms than in the novices groups.

Conc. A.2. The use of the most common type of tags (*"Facts"*) among the two groups, agrees with other studies on image subject categorization (Klavans, LaPlante, & Golbeck, 2013), with other game related experiments (Thøgersen, 2013), and with the tag analysis of the first *"Waisda?"* projects for TV broadcasts. These factual tags describe the content at a general level (Gligorov et al., 2011). Perhaps, as Halpin et al. (2007) indicate, tagging requires less cognitive effort, which would explain why experts tagging behavior was similar to the one of novices. Moreover, yet we think that a clearer explanation for the groups' similarity is the competitive nature of the game.

Conc. A.3. In general, the *"Waisda?"* game has proved to be useful for getting a relatively high number of relatively high quality time-stamped tags from general users as other authors have found out (Ahn & Dabbish, 2008; Gligorov et al., 2013). This poses the issue of how to join the advantages of a great number of common tags (which can improve indexing consistency, assumed to indicate quality (Good et al., 2009, p. 6)) with less frequent expert tags, assumed to be more relevant for specialized contexts (Tsai et al., 2011). In this regard, we confirm the need for extracting tag provenance information, which can add to the quality measures of the tags. This follows the tendency to mining not only the relationships between tags and documents, but the link between users, tags, and documents (as suggested by Good et al., 2009).

RQ1.2. *Can we influence the type of time-based tags that users enter with specific instructions based on conceptual frameworks?*

Conc. A.4. The main characteristic of the scholars perceived tagging behavior is the need to count with instructions about the types of tags expected from them for time-based tagging. Participants described in the open answers to the questionnaire several issues which can be summarized in these points: (a) taggers need to know which aspects or dimensions they should focus on during tagging; presenting several types of tags in the instructions may help, but the participant needs only one to keep the focus; (b) participants should have previous knowledge about the movies and clips (e.g., contextual or historical information and information about the clip itself), (c) the purpose of the tagging activity should be stated; and (d) term suggestions may help the tagger.

Conc. A.5. Most participants preferred to have a clear description of the type of tags they were expected to enter. In the case of moving images, where several dimensions co-occur, instructions should help participant focus on specific content or stylistic aspects and allow complementarity of novice and expert tags for the same video. For instance, one of the usage scenarios for online film archives to enrich and give access to their online digital collections could be to ask experts to contribute only cinematographic tags. In this way, film experts' tags could be used for novices in browsing and learning the cinematographic language, because expert tags seem to have the potential to augment the exploratory search of information. This holds especially for users who have little knowledge on a topic (as Kang & Fu (2010) found). Novices, on the other hand, should be guided to contribute facts (and eventually emotions or explanations) in their tags, according to expertise in other domains, not necessarily film-related backgrounds.

Conc. A.6. More research is needed to understand the way of obtaining and using descriptions of video scenes at the topical or "aboutness" and "ofness" levels. In combination with a model for moving image analysis (as suggested above), video labeling could benefit from this distinction by guiding the taggers, experts and novices, in focusing on what they can best contribute for describing the content. *Nichesourcing* could also gain from this by pointing the participants to using their expert knowledge instead of asking them to do what novices, or eventually content-based retrieval algorithms, could also do

Conc. A.7. Research is needed to understand how expert descriptions made outside a tagging setting can be used inside it. One potential use of expert time-based annotations is to support novices during learning, for instance, cinematographic language. One option is by using term suggestions from different glossaries or socially generated tags or keywords (for example, the IMDB plot keywords$^{(rw)}$), or from technical film glossaries, which quality the domain novice or expert should evaluate. Although these techniques are already in use, more theoretical work needs to be done to provide semantic models and classifications schemes specific for moving images, and to see how expert tagging can support learning. In general, more studies are needed to understand the way of motivating and obtaining significant time-based tags or annotations from film experts and novices for research or educational purposes, and not only

for footage finding.

RQ1.3. *What are the attitudes and perceptions of scholars and professionals towards tagging games? How to characterize their game tagging behavior?*

Conc. A.8. Participants from different groups pointed to different negative issues related to the game influence. These include (a) "multitasking" (i.e. watching the video, thinking of tags, typing it in); typing skills (having to look at the keyboard); (b) the impossibility to synthesize in a single word or in a couple of words the concepts they had about the fragments, and/or to recall the technical terms referring to shot types and editing; (c) language issues and spelling.

Conc. A.9. The reaction to scoring and gaming elements are very personal, and we cannot conclude any relation to domain expertise. Some experts made positive comments about the game itself and found it fun. Both among the experts and novices groups there were few participants concerned for having few matching tags. Not surprisingly, we found a positive correlation between scoring motivation and number of tags. A drawback of this correlation, also identified by Thøgersen (2013), is that since the game is set up to reward players based on matching tags. This encourages most players to tag what is in the picture, rather than thinking about other possibilities. There is a requirement that more varied game genres of a higher collaborative nature are investigated, as pointed out in Goh et al. (2011), since competition is not the best motivating factor for domain experts to contribute with their annotations.

Conc. A.10. In general, domain experts are also aware of the general principles of indexing and information retrieval. Therefore, this mechanism may have to be explicitly stated in tagging activities in the context of *"nichesourcing."*

Conc. A.11. Domain experts cast doubt on the tags' semantic value. They consider them very general and only related to describing what they saw in the images, without taking into account any context. For these experts, this does not correspond to describing the actual content of the film.

Conc. A.12. We confirm that a tagging game is not the best scenario to tap into the domain-specific-knowledge of experts (as it was somehow expected, and also pointed out by the experts themselves in their comments).

Conc. A.13. One aspect that was not possible to cover in this study, but which needs future exploration, is the analysis of the influence of film genre in the types of tags.

CHAPTER 6. Study B: Film Scholars' Information-Annotating Behavior of Moving Images: A Case Study

"A theoretical concept – even one that begins as merely a technical term [e.g., long take] – is designed to knit together diverse strands of an argument, refute opposing claims, and become a cutting edge to carry on future debates and actions."
(Branigan & Buckland, 2014, p. xxiii)

6.1. Chapter overview

This chapter reports on a study subsequent to Study A, based on the implications of its findings, and only focused on film scholars. It studies their information-annotating behavior (as defined in §3.4.1; 3.5.1). The data collection phase took place between October and December 2013.

Section 6.2 introduces the study and its specific research questions. Section 6.3 includes an introduction to an important concept in task-based information research, namely, "simulated work tasks" (Borlund & Ingwersen, 1997), and suggests their application to the study of information-annotating behavior, explaining the scope of their use in this study.

Next, the research design is detailed in section 6.4. It discusses the method, data collection techniques and research instruments ("simulated work tasks situations" as used in the context of this study), as well as the data analysis procedures.

Section 6.5 describes and discusses the findings related to the study's research questions: first, the annotation types and styles used by the scholars (*RQ2.1*, §6.5.1). Next, the attributes of the moving images that they found relevant in their descriptions (*RQ2.2*, §6.5.2), and last, the elements of the scholars' annotating behavior identified during the simulated work tasks (*RQ2.3*, §6.5.3). In addition to describing the findings related to the annotation types used by the scholars, this section also presents a proposal for their definition (e.g., synopsis, review) based on the results of the conceptual analysis.

This study was not designed with an explicit intention of examining textual forms. However, understanding its outputs called for the need to use concepts and analysis methods from related disciplines, such as the concept of transtextuality by literary scholar Gérard Genette. Section 6.6 includes a discussion about the principle of polyrepresentation (§3.3.3) and these concepts. Finally, the main conclusions and ideas for future work conclude the chapter.

Quotes from the participants are designated by the participant's number (e.g. p1) in this Study; also, quotes from participants from Study C are used, in those cases it is indicated by the abbreviation SC followed by the participant's number in that study (e.g., SCp1). See also the Section "Writing conventions" at the beginning of this thesis).

6.2. Introduction and research questions

From the previous study (Study A), it was concluded that time-based tagging is not perceived by film scholars as the best way to create annotations that could be used for further research purposes, and that a game setting may not the best scenario for eliciting domain expert annotations of moving images at the shot level. For this reason, a second study (Study B) was designed to investigate how scholars would annotate moving images in a more spontaneous yet structured way.

This study is designed following the theoretical framework proposed in Chapter 3. Accordingly, it assumes a broad concept of "annotation" (as defined in §3.4.1), and a set of interconnected elements that explain information-annotating behavior in an IS&R framework (as explained in §3.5.1).

These are the study's **research questions**, which are part of the broader *RQ2* (Table 1.2):

RQ2.1. What types of annotations are used by film scholars when assigned a moving image-annotating task for the purpose of future retrieval?

RQ2.2. Which attributes of the moving images are most relevant for film scholars when performing a describing task?

RQ2.3. What are the attitudes and perceptions of scholars towards their information-annotating behavior, and towards shared annotations?

Next, Section 6.3 includes definitions and a brief literature review of concepts that are important for this study.

6.3. Conceptual framework: Task-based information research

The concept of "simulated work task situation" serves as a methodological basis for this chapter. This section presents this concept, suggests its use for research about information-annotating related behaviors, and delimits the scope of its use in the context of this study.

6.3.1. Introduction to simulated work tasks

Traditional IR system evaluation has been done with specific methods, which can be traced back to the Cranfield studies (Kelly, 2009). These methods did not incorporate users and their interactions with a system. However, in the context of the cognitive theory of IR proposed by Ingwersen (1996), which suggests that one should look at information needs as "dynamic mental constructs" (Ingwersen & Willet, 1995, as cited in Borlund & Ingwersen, 1997, p. 226), an alternative method was presented by Borlund and Ingwersen (1997) that allowed incorporating interactive information data from the user. It was referred to as the "Interactive Information Retrieval Evaluation Model" (IIR evaluation model). The method has two aims: facilitating evaluation of IIR systems in a more realistic way by incorporating real

data from the information searching and retrieval process, and taking into account the non-binary nature of relevance assessments in the calculation of IIR system performance (Borlund, 2003).

The proposed method was based on tasks. Pharo (2002) points to the fact that there has been a lack of consistency in the literature in relation to the use of the term "task", sometimes used to refer to "work tasks" and others to "search tasks" (Hensen, 1999 & Vakkari, 2003, as cited in Pharo, 2002). Ingwersen & Järvelin (2005) explain that work tasks are the ones that serve as the *driving force* for interactive seeking and retrieval and information behavior (p. 282). A work task can be defined as an *activity* a person has to perform to accomplish a goal (Hansen, 1999; Vakkari, 2003, as cited in Skov, 2009). Work tasks can be job-related or not (associated with daily-life tasks or interests). In relation to the origin of the task, Ingwersen & Järvelin (2005) distinguish these types: natural (coming from real life), simulated (designed for research purposes) or assigned (as instrumental search jobs).

Search tasks, on the other hand, are a sequence of IS&R activities that are performed to fulfill the work task (Ingwersen & Järvelin, 2005). As these authors explain, search tasks include *retrieval* and *seeking tasks*. Retrieval tasks cover the use of an information retrieval system and seeking tasks involve other sources of information.

A S*imulated* work task (also known as "simulated work task situation") is a scenario designed by the researcher in the setting of a controlled experimental setup, in order to generate the information problem in the participant. It is not as simple as an assigned task since it includes more than a search topic, for instance, a more general description of the problem and contextual information. This is an important difference with evaluation frameworks such as TREC, which only uses topics (Borlund & Ingwersen, 1997, p. 229). A classic example of a simulated work task situation directed towards university students is depicted in Figure 6.1.

Simulated situation:

Simulated work task situation: After your graduation you will be looking for a job in industry. You want information to help you focus your future job seeking. You know it pays to know the market. You would like to find some information about employment patterns in industry and what kind of qualifications employers will be looking for from future employees.

Indicative request: Find, for instance, something about future employment trends in industry, i.e., areas of growth and decline.

Figure 6.1.Example of a simulated situation/ work task situation (Borlund, 2003)

Simulated work tasks were further integrated into the aforementioned IIR evaluation model (Borlund, 2000; 2003) because they allowed both for realism (since each person can interpret the situation) and control in the evaluation setting (since the same simulated work task is given to all participants). Kelly (2009) summarizes the nature of this approach, known as task-based research:

> "In interactive information retrieval (IIR), users are typically studied along with their interactions with systems and information. While classic IR studies abstract humans out of the evaluation model, IIR focuses on users' behaviors and experiences— including physical, cognitive and affective — and the interactions that occur between users and systems, and users and information." (Kelly, 2009, p. 2).

The IIR evaluation model is composed of three parts (Borlund, 2003): (1) the components of the experimental setting which guarantee that it is "as close as possible to actual information searching and IR processes, though still in a relatively controlled evaluation environment"; this part includes the use of simulated work tasks; (2) recommendations for the application of simulated work tasks situations; and (3) a proposal for alternative performance measures. As Borlund explains, part 1 and 2 are used in the data collection while part 3 is used in the data analysis.

The concept of simulated work tasks has been widely used in empirical research in information seeking and retrieval contexts. Borlund and Schneider (2010) carried out a study on how the concept of simulated work task situation is used in the research literature, finding at least 85 papers reporting about actual empirical evaluations by use of simulated work task situations. In those studies, only search was evaluated.

6.3.2. Simulated work tasks applied to the study of information-annotating behavior

In relation to the topic of this thesis research, Borlund and Schneider (2010) report on two studies that have been done in the area of image retrieval by using simulated work tasks: Haggerty, White & Jose (2003) – about adaptive TV news on the web; Jose, Furner & Harper (1998) – about spatial querying of fixed images; and one study in the cultural heritage sector: Skov & Ingwersen (2008) – a case study of task-based interactive information seeking and retrieval behavior of virtual museum visitors in context. The studies above are related to the audiovisual domain, but they are only focused on information seeking or searching. Indeed, as it was indicated before (§3.2.3), IB research has focused on seeking and searching behaviors. However, there are other types of IB, such as annotating information, which have not received the same attention from this discipline.

Researchers in different fields have studied people tagging (e.g., Bar-Ilan et al., 2010), but have focused on analyzing the resulting tag sets, instead on the tagging behavior as such. Other researchers have combined the use of annotating-related activities with searching, for instance, Melenhorst et al., (2008), who designed an experiment with two groups: one performing the annotating activity (tagging), and the other searching by using the tags created by the first group, plus other types of metadata.

One of the few studies that could be representative of the study of information-annotating behavior is Phuong's (2011). In this master thesis, the researcher studied tagging behavior "processes" by general users using the sites "CiteULike"$^{(rw)}$, "LibraryThing"$^{(rw)}$, "YouTube"$^{(rw)}$ and "Flickr"$^{(rw)}$. Participants were asked to tag selected items, and to make explicit their activities and choices through the use of a "talk aloud" protocol. The author used "tasks" that

seem to follow, to a certain extent, the structure of simulated work tasks but, unfortunately, did not make an explicit reflection on this methodological choice[73].

Thus, apparently, simulated work tasks have not yet been applied to the study of information-annotating related activities[74]. However, there is theoretical support for claiming that "simulated work task situations" could be extended, and be useful, for the study of information-annotating behavior. Notably, the work by Jörgensen (2003) provides a background in the field of image description studies. She systematized previous research using pictorial images and found that there were two major types of "tasks" used in the testing. Those tasks were: (a) describing, and (b) categorizing (sorting). The image-describing tasks, as explained by Jörgensen, could be, in turn, a "descriptive viewing tasks" or "descriptive memory task." In the descriptive viewing tasks, the participants are requested to produce simple, spontaneous descriptions, writing words or phrases that "pop into their heads" until they could think of no more (p.204). In the "descriptive memory task", the participants were asked to write descriptions of the images from memory. The image-sorting tasks, explains Jörgensen, provides a method for elicitation of attributes which does not use pre-established categories, but lets people use their "own constructs" (p.215).

Jörgensen cites some investigations with fixed images using those methods, and the study by Turner (1995) with moving images. Turner's (1995) study is a continuation of his doctoral research, in which he investigated how a group of participants described selected film shots with words or phrases that they considered were keys for a future retrieval purposes, either for themselves or for others (Turner, 1994, as cited in Jörgensen, 2003). Even though the studies cited by Jörgensen and her own studies provided clear instructions to the participants about the image describing or sorting activity, the researchers did not seem to provide contextual details about the source of the information need for creating their descriptions, or if it was provided, it was too broad. There did not seem to be information about the environment of the situation, or the problem to be solved, and/or a clear purpose of the task.

As shown above, the studies related to annotating information already suggest some of the elements of simulated work tasks that are detailed in Borlund (2012). Since the method of simulated work tasks has proved to be useful in information seeking studies, there seem to be grounds to suggest that using that method could add value to the study of information annotating-behavior.

According to Borlund (2000a), a simulated work task situation, in the context of the evaluation of interactive information retrieval systems, "triggers and develops a simulated

[73] I wish to acknowledge the inspiration that this work by Phuong provided for this thesis. I participated as a test person in her research and am aware that her supervisor, Prof. Nils Pharo, has worked intensively on work tasks. They anticipated the use of simulated work tasks applied to the study of information-annotating behavior.

[74] A current project by the University of North Carolina at Chapel Hill, the University of British Columbia, and the University of Sheffield attempts to create a repository of simulated work tasks, calld "Systematic Review of Assigned Search Tasks"[(rw)]. In that collection the user can search studies that have used simulated work tasks, by filtering these by type. A search in this repository using the words: tagging, annotation, indexing, did not give any relevant result. Based on this, and on a the literature review conducted in Chapter 3, it is possible to conclude that simulated work tasks have not been used in information use/annotation studies.

information need by allowing for user interpretations of the situation, leading to cognitively individual information need interpretations as in real life" (p.79). Since the interest in this thesis is in investigating real behaviors of users' interaction with information, the use of simulated work task situations seems to be suitable for studying information-annotating behavior. In this case, the previous statement would then read: "simulated work task situations trigger and develop a simulated [annotating] situation by allowing for user interpretations of the situation, leading to cognitively individual [information annotation] based on the users' resource interpretations as in real life" (adapted from Borlund, 2000).

However, even though this section has shown that there is ground to propose the use of simulated work tasks (and, in general, of the IIR evaluation model), as a method for the study of how non-traditional annotations (e.g., tagging, commenting) influence retrieval performance, this thesis does not attempt to develop this method. Instead, the second parts of the IIR evaluation model (i.e., recommendations for the application of simulated work tasks situations) is used as a data collection technique, that is, as strategies for collecting data from the participants, and not as part of an IIR evaluation setting. This partial use of the method has already been proposed and used by Skov and Ingwersen (2008) and Skov (2009); and who applied "simulated search task situations" as one of the research instruments to collect data on a study of virtual museum visitors' searching behaviour. Hence, it is important to summarize these issues in relation to the use of simulated work tasks in this thesis:

- Even though simulated work tasks (and the IIR evaluation model as a whole) can be applied to evaluate not only searching, it is not within the scope of this thesis to implement this idea in a concrete proposal.
- The IIR evaluation model is composed of three parts (see §6.4.1), from which only part 2 (i.e., recommendations for the application of simulated work tasks situations) is partially used in Study B. These recommendations were taken into account in the design of a "simulated work task situation" that is used during an interview as a trigger for the annotating-activity (and subsequent discussion), but not as part of a controlled task-based research setting.

6.4. Study design

This section relates to the theoretical framework proposed in Chapter 3 (§3.4.2.3), which depicts the elements and relations involved in an annotating (glossing) activity from an IS&R framework when annotations are created using any type of technology, being it or not an interface. The most important "actor dimensions" (§3.6.1) are: his/her declarative knowledge and procedural skills, their perception of the "work" task (a simulated work task situation in this case), and the perceived annotating tasks (the actor's perception of the annotating task including the perceptions and emotions of the task performance). Equally important are the "organizational task dimensions", in the sense that a simulated organizational context is suggested to the participants; and the "document dimension," mainly in what concerns the

annotations created by the participants as a result of a work session.

The following sections explain the study design, according to the research terminology used in this thesis (§4.2).

6.4.1. Method

For investigating the research questions described above (§6.2), a group of film and media scholars was selected as a study case, and their annotating behavior analyzed.

6.4.2. Selection of participants

In contrast to Study A, in which also film professionals were included, in this study only film scholars were invited to participate in order to guarantee homogeneity, as recommended by Borlund and Schneider (2010): “the advice to tailor the simulated work task situations entails homogeneity of the group of study participants. They need to have something in common.” (p.157). The potential participants were located in Madrid, Spain.

They were selected using purposive sampling (i.e., one experienced scholar provided initial contact with suitable candidates). They were invited via an email, which explained the general purpose of the investigation but did not include specific details about the procedures. The final group of participants included ten experienced film scholars, who worked at five different universities in Madrid: Autonomous University of Madrid (Art History department); Camilo José Cela University (Communication Sciences department); Carlos III University of Madrid (Audiovisual Communication department); Complutense University of Madrid (Audiovisual Communication department); and King Juan Carlos University (Communication Sciences department). The scholars had ten or more years of experience in publishing, teaching, editorial activities, or festival committees.

Table 6.1 summarizes these demographic details.

Table 6.1. Participants Study B.

No.	Institution	Academic status	Age range	Main research area
P1	Cervantes Institute / Autonomous University of Madrid	Independent researcher and Ph.D. supervisor	40-49	Film historian. Spanish and Latin American cinema
P2	King Juan Carlos University	Professor	40-49	Film historian. Film language and theory, and early cinema
P3	Complutense University of Madrid	Assistant Professor	40-49	Information and Communication scholar specialized in gender representation in film and media
P4	King Juan Carlos University	Professor	40-49	Film historian and Information specialist, specialized in film history and theory, Spanish cinema and early cinema
P5	Complutense University of Madrid	Professor	50-59	Audiovisual communication scholar and film historian specialized in documentary films and Spanish cinema and television
P6	King Juan Carlos University	Assistant Professor	40-49	Audiovisual communication scholar and film historian specialized on the cinemas of the Maghreb
P7	Autonomous University of Madrid	Professor	50-59	Media scholar and historian specialized in European film history and the representations of Spanish cultural identity in film history
P8	Camilo José Cela University	Associate Professor	30-39	Film scholar specialized in documentary films, Spanish film history (1960-1970), and the relations between women and cinema
P9	Carlos III University of Madrid	Assistant Professor	30-39	Philologist and film historian specialized in Iranian cinema and cultural studies*
P10	Carlos III University of Madrid	Assistant Professor	30-39	Audiovisual communication scholar specialized in documentary, avant-garde and experimental films, Spanish history in films (especially Spanish civil war)

6.4.3. Data collection techniques and research instruments

The data was collected through an interview session with each participant, consisting of an in-depth and semi-structured interview that included a “work” session in which simulated work

tasks situations were used in order to trigger an annotating activity. The interview included pre-established questions (themes that were guided by this thesis' research questions, in combination with others that emerged from topics found in the literature review presented in Chapter 2). This type of interview allows the participants for open-ended answers with no limited set of response categories (Pickard, 2007, p. 175).

Since the use of simulated work tasks is a recognized part of a method for the evaluation of IR systems, the next section explains this concept and the scope of its use in this study. Also, the design of the simulated work tasks situations is described later (§6.4.4).

6.4.3.1.Design of the simulated annotating-task situations

The design of the simulated information-annotating tasks situation was done following the guidelines for designing simulated work tasks by Borlund and Ingwersen (Borlund, 2000a, 2000b, 2012; Borlund & Ingwersen, 1997), besides practical advice by Kelly (2009) and Borlund & Schneider (2010). The overall IIR model is composed of three parts (§6.3.2.1). Only the "recommendations for the application of simulated work tasks situations" (i.e., part 2 of the model) were used. The most important criteria used for the design of the information-annotating tasks were: the importance of realism in the scenario description; the need to tailor the task to the characteristics of the participants' group; the potential interest in the topic; and the space for interpretation by the participant by providing enough imaginative contexts. Several considerations had to be taken into account:

- The context of the situation. Because the thesis' case study focuses on the domain of film and media scholars, four potential contexts for the annotating situation were differentiated (derived from the literature studies): formal education, academic research, dissemination or cultural promotion, production/reuse, entertainment sector, and personal leisure. The selected context was "Academic", with two different scopes: one specifying the use for teaching purposes, and the other one refining the context of use to research purposes. This resulted in three tasks: Sim 1, Sim 2 (a) and Sim 2 (b).
- Additionally, according to the theoretical model (§3.4.2.3), 'annotating' behaviors, such as in note-taking acts, may not be mediated by specific information processing systems. Also, since the aim of this study was not to perform any information system evaluation, the use of paper or word processors was suggested to the participants for writing the annotations. Participants were not conditioned in this way to select a specific type of annotation, e.g., tags or use any specific annotating information system as in study A.
- Because there are several ways of annotating information (identified in Chapter 2 and 3), and it was concluded in the previous study (Study A) that scholars may have other preferences for annotating rather than using tags and or video labeling tools, it was decided to combine in the study a free task, where no annotation type was suggested, and a task with suggestions about some of the possibilities (i.e., tags, comments, formal analysis, etc.)

By Combining the previous factors, there were two resulting annotating tasks: a task where any type of annotation was suggested and was context-independent (Sim1); and a task in which different types of annotations were suggested, and was context-dependent (Sim2). Both tasks were independent of any information processing system. They are explained next:

–***Sim1: Open annotation type, context-free.*** The first task (Figure 6.2), the participants are asked to annotate selected clips, independently from a specific organizational context (i.e., for use on the "open web").

Information-annotating task 1 (Sim1).

Due to difficulties in your economic situation you decide to search for an online job to work for extra hours. Luckily you find one that requires film experts. You accept to do this job. What you receive is a password to access a site with hundreds of movie clips and some full movies. Each of these is identified with its title, director, production year and country, the actors and complete technical information. Details about the content are missing though. The instruction you receive is very short: "help people to discover the content of these clips and/or movies."

How would you do it? There is no "correct" way of performing this activity, you are free to select the best way to accomplish it. Please keep in mind that as in many online jobs, it is better not to take too long.

In.

Figure 6.2. Simulated work task situation (Sim1) as used in the information-annotating behavior study[75].

The situation in Sim1 above is built departing from a general text used from an existing web video platform (i.e., Vimeo) which instructs its users when they upload a video in this way: "*Add some relevant keywords to make your video easier to find. (Separate your tags with commas, please.)*". However, in this task, the participants do not receive any instructions about which type of annotation they are expected to use, only to write down anything that they wish after reading the task and watching the clips. The overall aim of using this task is to observe which type of annotation would be more natural to the scholars when asked to perform an annotating activity that involved a future retrieval purpose, to know which features of the clips they would consider relevant, and to know which "people" they had in mind for the future retrieval purpose

–***Sim2: Suggested annotation type, context dependent.*** In the second task (Figure 6.3, and Figure 6.4), the scholars were informed better about the context or setting in which the annotations would be used, and also received brief hints on possibilities for the annotation form that they could adopt (e.g., synopses, tags, sequence or shot-by-shot analysis). The objective of this task is to observe whether giving details of a certain organizational use context influences the selection of a specific type of annotation and/or the types of concepts or terms used by the scholars. There were two contexts selected for Sim2: one was education, and the other was research. These two contexts were selected since this was close

[75] This text, as well as the text of Sim2 were presented to the participants in Spanish.

to the real daily work of the participants. Figure 6.3 shows the simulated annotating task for Sim2 in the context of teaching tasks.

Information annotating task 2 (Sim2-a). Academic context (teaching).

You have been hired to work as a film expert at the media archive of a big university. Your job is to annotate (tag, make sequence or shot by shot descriptions, and/or summarize) the content of movie clips or complete movies. The goal of this task is to help teachers to find audiovisual sources useful for their lectures, for instance, to present examples of the topics they teach (cinematographic language, film history, etc.). Additionally, this media archive also assists the film club in their regular program. Students and teachers from different áreas attend this film club (from humanities, social sciences, ingeneering, law, medicine, etc.).

Today, you found these two clips and a full movie. They already have all technical details, but lack all information about their content. Which descriptions would you provide in order to support teachers and the film club organizers in their activities?

Figure 6.3. Simulated work task situation (Sim2-a. Teaching use) as used in the information-annotating behavior study.

Figure 6.4 shows the simulated annotating task for Sim2 in the context of research-related tasks. In practical terms, for the analysis, Sim2-a and Sim2-b were considered the same (Sim2).

Information annotating task 2 (Sim2-b). Academic context (research).

You have been hired to work as a film expert at the media archive of a big university. Your job is to annotate (tag, make sequence or shot by shot descriptions, and/or summarize) the content of movie clips or complete movies. The goal of this task is to help teachers to find audiovisual sources useful for their lectures, for instance, to present examples of the topics they teach (cinematographic language, film history, etc.). Additionally, this media archive also assists the film club in their regular program. Students and teachers from different áreas attend this film club (from humanities, social sciences, ingeneering, law, medicine, etc.).

Today, you found these two clips and a full movie. They already have all technical details, but lack all information about their content. Which descriptions would you provide in order to support teachers and the film club organizers in their activities?

Figure 6.4. Simulated work task situation (Sim2-b. Research use) as used in the information-annotating behavior study.

Summarizing, the two previous tasks (Sim 1 and 2) are similar in that the future retrieval goal (i.e. to make clips or movies discoverable for other users or themselves at a later stage) is indicated, and in that both are independent of the use of any particular information system, that is, participants received the suggestion to use a piece of paper or any Word processor, but could have used any other tool of their preference. The tasks differ in two aspects: Sim1 did not suggest any hints on which possible types of annotations could be added, while Sim2 presented some suggestions; and Sim1 lacked indications about the context or purpose that

their annotations would serve for while Sim2 described the setting in which retrieval would take place.

One of the recommendations in the design of simulated work tasks is a permutation of their order between the test participants (to guarantee counterbalancing). This aspect was not implemented in this study, since the information about the types of annotations provided in Sim2 could influence their choices in Sim1 if they were switched. Hence, the tasks were performed in the same sequence for all participants (Sim1 + Sim2). Each participant was randomly assigned the task with the specific context of use, e.g., Sim2-a or Sim2-b.

6.4.3.2.Interview guide and protocol

Each scholar was invited to participate in a one and a half to two-hour interview session, preferably in her/his own working space. In IIR evaluations where simulated work tasks are used, the experiment setting is normally highly controlled. Contrarily, because of the nature of this study, the choice was to observe the scholar in her/his natural work environment, since the purpose was to study her/his behavior, being in a familiar space, and being able to use her/his own appliances were considered an advantage.

After an introduction to the study, the session was divided into three blocks. These were the original main parts of the entire interview session with each participant:

- Part 1. Annotating. Simulated information-annotating task situations, and
- Part 2. Tagging and sharing. Several activities related to tagging, evaluating and sharing tags. (This part is not included in the quantitative analysis).
- Part 3. IB. Information needs and seeking behavior questionnaire;

Part 1 was detailed in the previous section. Part 2 includes a series of activities that motivate the scholars to discuss and perform certain actions. The activities in that part consist of annotating-related activities, such as playing the *"Waisda?"* game that was used in Study A, evaluating the relevance for the scholar's own research of a set of keywords assigned to videos in YouTube or Vimeo, and evaluating the relevance of set of plot keywords for a selected movie from the IMDB database. Finally, Part 3 consists of administering a questionnaire related to the scholars' general details, and information needs and seeking behavior.

As Borlund (2012) suggests, a protocol should be designed for the test, to act as a guide for the overall study procedure. It serves the purpose of ensuring consistency. In this case, the protocol was part of the guide for the overall interview session. Table 6.2 shows the structure of the interview session, following the same sequence in which each part took place, including the order of the simulated work tasks (i.e., Sim1+Sim2, as explained in the previous section). The protocol of the full session is included in Appendix F.

Although the steps specified in the protocol were followed equally in each session, the participant always had the possibility to comment or ask questions at any moment. Also,

there were specific moments for the discussion after finishing each part and the full session. In this way, data was obtained through participants' talking or thinking aloud.

The audio of the complete session was recorded. Additionally, in both tasks the participants' annotating behavior was observed, and notes were taken by the researcher, noting for instance if they replay the clips, if they search on the internet about the films or clips, or what types of questions they had about the tasks (e.g., if they ask more about the purpose of their annotations).

As recommended in the simulated work tasks literature, a pilot study was conducted. A master student of LIS volunteered for the task. The pilot was conducted twice with the same person, with the aim of checking if the tasks were understood by the participant, if there were additional necessary practical arrangements, and if all the required data for the analysis could be obtained.

Each participant received a sheet with basic information about the movies from which the clips were selected (Appendix G). The rationale for selecting the clips is presented next.

Table 6.2. Interview session structure and data, Study B[76]

Part	RQs	Data collection instrument	Description	Information objects[77]	Data (set[78])	Data Analysis for Study B	Findings (section, §)
Part 1: Annotating	RQ2.1. to RQ2.3	Sim1.	-The future retrieval goal is indicated. -Technology independent. -No suggestions of annotation types. -Context of use is not indicated.	-Clip1 -Movie1	(a). Annotations (tasks output) (b). Observation notes (c). Interview audio recording	-Classifications No.5-7 to dataset (a). Dataset (b) not analyzed, only for support -Open coding to dataset (c)	§§6.5.1-6.5.2
Part 2: Tagging & sharing	RQ2.3	Tagging game + sharing and evaluating tags in a social video sharing platform	-Playing the *"Waisda?"* game that was used in Study A -Qualitative evaluation of socially generated tags evaluating the relevance for the scholar's own research of a set of keywords assigned to videos in YouTube or Vimeo, and evaluating the relevance of set of plot keywords for a selected movie from the IMDB database.	Movie 1	(d). Tags (e). Questionnaire 1 (Part3) (c). Interview audio recording	-No quantitative analysis to datasets (d) and (e) -Open coding to dataset (c)	
Part 3: IB	RQ3	Questionnaire No.2 (Appendix I)	Complementary study related to Study C about information needs and seeking behavior, intended to get insights from the participants about how annotation takes place in their normal information seeking and search behavior	(None)	(c). Interview audio recording (f). Questionnaire 2	-Open coding to dataset (c)	§6.5.3, (and Study C, Chapter 7)

[76] Detailed Protocol in Appendix F.
[77] The selection is detailed in the next section. The order corresponds to the sequence in which they were shown.
[78] The letters in parenthesis indicate data sets, the procedures for analysis of each data set are explained in §6.4.4.

6.4.3.3.Selection of film clips

Two film clips and two full-length movies were included as test information objects for Parts 1 and 2 of the interview session. For this study, the two selected clips were the same as for Study A. Thus, information on these clips can be found in Section 5.4.4. In this study (Study B), the number of the clip corresponds to the protocol described before (Table 6.2.)

- **Clip 1**: "Vampyr" (Carl Th. Dreyer, Germany/France, 1932, [01:36]) (it was used as a control clip in Sim2).
- **Clip 2**: "Den flyvende cirkus" (Alfred Lind, Denmark, 1912; [02:02]).
- **Movie 1**: Any favorite movie selected by the participants (the only criteria: they know it well, and/or have used it in their studies).
- **Movie 2**: "L'aiguille" (William Piasio, Switzerland, 1961, [05:55]). Since this is a short film, we include it as "movie", because due to time limitations it was not possible to include a longer feature in the session.

The clips were different in each task with the aim of avoiding a possible effect of familiarity with the content. However, Clip 1 was used as an additional control object in Sim2. That clip was also used in Study A, and thus, it could be useful for triangulation. It was also used for the analysis of the types of attributes in §6.5.2, for facilitating comparison between the two tasks. The clips or movies used in Part 2 of the interview session are not detailed since they were selected differently by each participant.

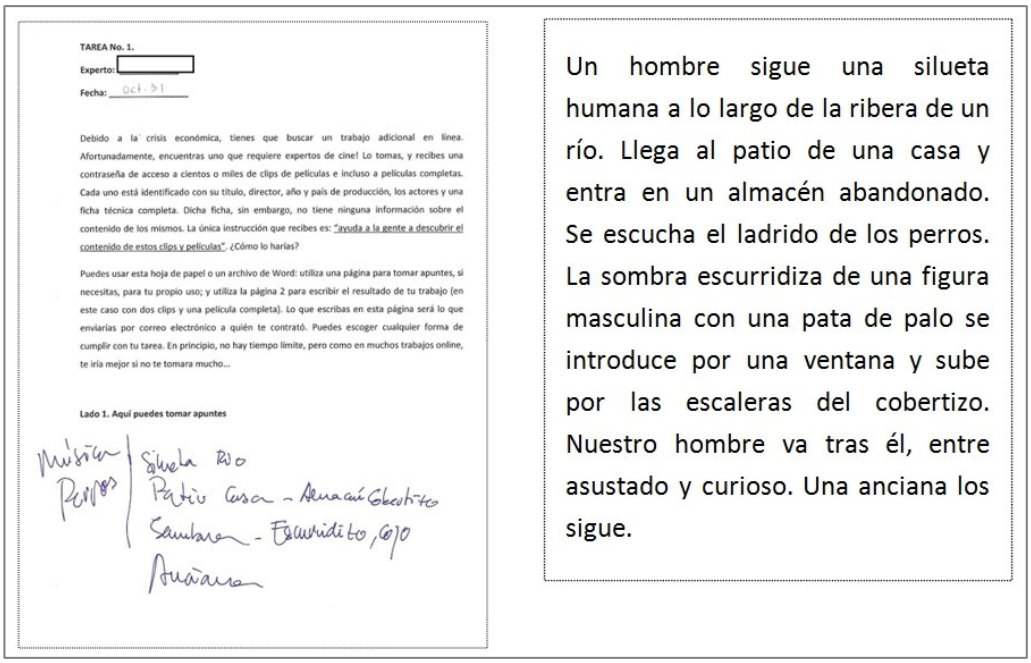
The order in which the objects were viewed is specified in Table 6.2. The inclusion of at least one information object selected by the participants (Movie1) was chosen as a way to follow the recommendation of making the situation as realistic as possible.

6.4.3.4.Resulting "data sets."

There were different types of data collected during the interview session. They are grouped in six "data sets", which are summarized in Table 6.2. Details about each set of data are explained below, the number of each dataset corresponds to the number in the column "data (set)."

(a) Dataset: annotation outputs (occasionally simply named "annotations")**.**

This set of data included the annotations created during the annotating activity in Part 1 of the session. They consisted of two types: preliminary notes that were taken by the participants while watching the clips during each annotating task (Figure 6.5., left, hand-written notes), and the final output handed in to the researcher (Figure 6.5., right, a text in a Word file). Annotations were done either on paper or in a word processing system, as suggested in the tasks. When there were unclear words in any of the hand-written outputs, a transcription was sent to the participant for revision.


TAREA No. 1.

Experto: [redacted]

Fecha: oct-31

Debido a la crisis económica, tienes que buscar un trabajo adicional en línea. Afortunadamente, encuentras uno que requiere expertos de cine! Lo tomas, y recibes una contraseña de acceso a cientos o miles de clips de películas e incluso a películas completas. Cada uno está identificado con su título, director, año y país de producción, los actores y una ficha técnica completa. Dicha ficha, sin embargo, no tiene ninguna información sobre el contenido de los mismos. La única instrucción que recibes es: "ayuda a la gente a descubrir el contenido de estos clips y películas". ¿Cómo lo harías?

Puedes usar esta hoja de papel o un archivo de Word: utiliza una página para tomar apuntes, si necesitas, para tu propio uso; y utiliza la página 2 para escribir el resultado de tu trabajo (en este caso con dos clips y una película completa). Lo que escribas en esta página será lo que enviarías por correo electrónico a quién te contrató. Puedes escoger cualquier forma de cumplir con tu tarea. En principio, no hay tiempo límite, pero como en muchos trabajos online, te iría mejor si no te tomara mucho...

Lado 1. Aquí puedes tomar apuntes

Música | Silueta Río
Perros | Patio Casa - Almacén Abandonado
Sombra - Escurridizo, C/O
Anciana

Un hombre sigue una silueta humana a lo largo de la ribera de un río. Llega al patio de una casa y entra en un almacén abandonado. Se escucha el ladrido de los perros. La sombra escurridiza de una figura masculina con una pata de palo se introduce por una ventana y sube por las escaleras del cobertizo. Nuestro hombre va tras él, entre asustado y curioso. Una anciana los sigue.

Figure 6.5. Example of preliminary notes and final annotation outputs hand in by the participants[79].

(b) The researchers' observation notes.

This includes the observation notes (from observed behavior and self-reflection) taken by the researcher during the session (§6.4.3.2).

(c) Interview audio recording.

The audio of the complete interview session (between $1^{1/2}$ to 2 hours was recorded).

(d) to (f). Complementary data.

Dataset (d) included a list of tags given by the participants (or registered in the researcher's own notes). Those tags were selected while evaluating or tagging videos as a result of the activities performed in Part 2 of the session. It also includes two filled-in questionnaires: Questionnaire 1 (Dataset e) (Appendix E, Part3), and Questionnaire 2 (Dataset f) (Appendix I).

6.4.4. Data analysis procedures

The data analysis procedures were different depending on the dataset (described above) and the research question. A summary of the analysis procedures is shown below (Table 6.3).

[79] The texts were provided in Spanish. Translation was not needed for analysis purposes, although translated excerpts are included in some parts of this chapter, only for presentation purposes. The English version of the text on the right side is: "A man follows a human shape along the shore of a lake. He arrives to a house's bakyard and goes in into an abandoned warehouse. Dogs barking can be heard. The running shadow of a male shape with a wooden leg crosses a window, and clibs the shed's stairs. Our main follows him, between scared and curious. An old lady follows them.

Table 6.3. Data analysis procedures, Study B

<table>
<tr><th>RQ</th><th>Dataset</th><th colspan="2">Classifications</th><th>Type of analysis</th><th>Findings</th></tr>
<tr><td rowspan="2">RQ.2.1</td><td rowspan="4">(a)
(analysis supported by datasets b[80] and c)</td><td rowspan="2">Classification No.5. “Annotation type”</td><td>“Broad annotation type”: (Formal text, Open text, Combined).</td><td rowspan="4">Quantitative</td><td rowspan="2">§6.5.1</td></tr>
<tr><td>“Specific annotation type”: (open codes: Appendix B)</td></tr>
<tr><td colspan="2">Classification No.6. “Discourse mode” (Descriptive, narrative, argumentative, instructive).</td></tr>
<tr><td rowspan="3">RQ.2.2</td><td rowspan="3">Classification No.7. “Attribute type”</td><td>“Broad attribute type”: (Facts, Emotions, Explanations, Cinematography, Other).</td><td rowspan="3">§6.5.2</td></tr>
<tr><td>“Specific attribute type”: (open codes: Appendix B)</td></tr>
<tr><td>“Granularity level”: (Movie, Clip/Shot)</td></tr>
<tr><td>RQ.2.3</td><td>(c) + (e) (f)</td><td colspan="2">Open coding + classifying, and categorizing (detailed in §4.7). Analysis guided by aspects identified in §3.4.2)</td><td>Qualitative</td><td>§6.5.3</td></tr>
</table>

The procedures for the different types of analyses are detailed next. The numbers assigned to each “classification” used in the analysis correspond to the number in the thesis “code book” (Appendix B). (See also §4.7 for details about the use of the code book).

–***Classification No.5: Annotation type***. This classification was used for the quantitative analyses for RQ.2.1. The resulting annotation outputs (dataset a) consisted of 50 annotation instances created by the ten participants (i.e., 2 annotations from Sim1, plus 3 annotations from Sim2 per participant). In this part of the analysis, the annotations from “Clip1” used in Sim2 (control clip) were left out. The resulting set of 40 annotations was fully analyzed using the same procedures described in Section 4.7 (open coding + classification). The complementary notes taken by the participants (dataset b, Figure 6.5, left side) were not counted as separated outputs, but linked to its corresponding main output, and used as support for the analysis. The following procedures were used in this part of the process:

i.*Initial open coding*. The types of annotation outputs emerged through an initial analysis based on its form or structure (i.e., tags, phrases, texts, etc.). This initial phase revealed the

[80] These outputs were not analyzed, but were useful for the researcher during interpretation of other data sets.

need to use domain specific terms for the different categories (e.g., "synopsis", or "film review"). Due to the lack of normalized terminology within film studies or film-related standards[81] for textual descriptions of film works, a combination of sources was used to create a normalized set of categories and their definitions. The resulting list is called "*Classification No.5*-Specific annotation type" in Table 6.3. The final categories (i.e., keyphrase*; plot outline*; plot summary*; review (film)*; storyline"*; synopsis*; critical synopsis*; shotlist; tag*/keyword*) are included in the analysis code book (Appendix B).

ii.*Categorization*. The previous types were grouped into broader categories that the researcher derived from common patterns. The resulting list is called "*Classification No.5*-Broad annotation type" in Table 6.3. The categories in this classification are: *"formal text"*, *"open text"*, *"combined"*. Their definitions are explained in the findings section, and are summarized in Appendix B. The terms used for this normalization do not come from any predefined standard or professional terminology.

iii.*Inter-annotator agreement test.* The final set of annotation outputs (n=40) was manually classified by the author of this thesis using the classification described above (*Classification No.5* –broad, specific). Since these categories were not used before in this thesis, to assure the consistency of the classification criteria, a sample of these annotations was classified by a second person at a later moment, when the types of categories were stable after the initial codings. Following the same procedure used in Study A (§5.4.7), a sample of 20% of the total dataset (n= 8 annotation outputs) was classified by a second annotator. The Cohen's kappa (k)2 was used as a measure of agreement between both annotators. The results showed a moderate agreement for "*Classification No.5*-narrow" (k=0.53), and total agreement for "*Classification No.6*-broad (k=1)." Hence, these classifications were used in the final analysis.

–***Classification No.6: Discourse mode***. This section describes an additional quantitative analysis under RQ.2.1. After the previous analyses, there was a need to study the open textual type of annotations more in detail, in order to understand the reasons for the participants' choices and their communicative intention. Even though the analysis of textual structures falls in the domain of discourse and semiotic analysis, which is beyond the scope of this thesis, the widely accepted concept of "discourse modes" was used. This concept originates from literary studies, and was considered appropriate for the interpretation of annotating behavior (intentionality of the annotation in this case). The procedure consisted of the following steps, applied to a resulting set of 34 annotation outputs from 50 outputs created in Sim1, and Sim2 (including all five clips used, that is, also the annotations to the control clip):

i.*Definition of categories*. Contrarily to the procedures followed in *Classification No.5*, the types of discourse modes were defined apriori, taking into account the literature on the subject. The main two sources used for terms and definitions were: Smith (2003) and

[81] The forthcoming edition of the FIAF Cataloging Rules suggests three types of summaries (i.e synopsis*, shotlist* and review*) (EN 15907 6.17.3 Elements Description type p. 30 as cited in International Federation of Film Archives 2014). These terms were used for the emergent codes or categories (Appendix B).

Fludernik (2000). The resulting list of categories is called "*Classification No.6*-Discourse mode" in Table 6.3; the final categories (i.e., "argumentative*", "descriptive*", "informational*", and "narrative*") are defined in Appendix A, and are part of the thesis "code book" (Appendix B).

ii.*Segmentation*. All annotations (n=34) that were of the type "Open texts" or "Combined" (after using *Classification No.5*) were included in the sample. It is important to notice that one annotation output (e.g., an open text) could include several types of discourse modes. For this reason, each text was segmented by sentence or paragraph where the same discourse mode occurred. In a few cases, there were different discourse modes occurring within the same sentence. When these modes were clearly distinguishable, the sentence was divided into smaller units. In the cases in which discourse modes were mixed (for instance, in a narrative sentence that also incorporates descriptive elements), the sentence or fragment was not segmented into smaller units since the purpose was to analyze the text at the sentence or major phrases level.

iii.*Classification.* In this step, one of the discourse modes from *Classification No.6* (step i) was assigned to each resulting block from step ii. In the cases in which discourse modes were mixed in a single block, and it was not possible to segment further without losing the coherence of the phrase or sentence, only the predominant mode was assigned. When the annotation was "combined", only the open text was analyzed. Also, in some cases, also the audio recording helped in validating the resulting categories since the participant may have indicated which her/his communicative intention was.

iv.*Inter-annotator agreement test.* The final set of annotation outputs (n=35, corresponding to all annotation outputs that were classified as "open texts" or "Combined" in the previous classification) was manually classified by the author of this thesis using the classification described above (*Classification No.6*). Since this classification was not used in this thesis before, to assure the consistency of the classification criteria, a sample of these annotations was classified by a second person. Following the same procedure used in Study A (§5.4.7), a sample of 20% of the total 35 set of annotations (n=7) was classified by a second person. The Cohen's kappa (k)2 was used as a measure of agreement between both annotators. The agreement for the segmentation process was good (k=0.75), and the agreement for the discourse modes according to each agreed sentence was also good (k=0.72). Hence, these classifications were used in the final analysis.

–***Classification No.7: Attribute type***. This section describes the quantitative analyses for RQ.2.2. A number of annotation outputs from Study B (Clip 1-Sim1 and Clip1-Sim2 -control clip-, i.e., 20 annotation outputs) were coded in order to identify the specific content attributes upon which the scholars focused their descriptions. For this analysis, only Clip1 was used ("Vampyr") for the purpose of triangulation (since it was used in both tasks, and also in Study A). Three types of codes were used to describe the attributes (Classification No.7: broad, and specific, and also granularity level). The following procedures were used in this part of the process:

i.*Segmentation.* Due to the fact that annotations included open texts and keyphases (not only tags as in Study A), these had to be segmented into smaller parts, in order to determine their corresponding specific attributes. In this study, the method applied for segmenting "open texts" and "keyphrases" consisted of a basic manual syntactic analysis of the major phrasal categories (i.e., noun phrases (NP), verb phrases (VP), adjectival/adverbial phrases (AP), and prepositional phrases (PP)). This decomposition of the major syntactic constituents of each sentence is explained for instance in Koopman et al. (2003). For example, considering the following excerpt:

> "The main character, a middle-aged man, well-dressed, follows the steps of another character in the distance. This character, characterized with a wooden leg, is actually a shadow projected on different surfaces. For the general atmosphere of the fragment, we can interpret that the shadow refers to a spiritual being associated with the world of the uncanny." (Annotation output, participant 5, study B)[82].

An initial sentence segmentation (using the period as boundary) results in three sentences:

- S1: The main character, a middle-aged man, well-dressed, follows the steps of a character in the distance.
- S2: This character, characterized by having a wooden leg, is actually a shadow that is projected on different surfaces.
- S3: Because of the general atmosphere of this fragment, we could interpret that the shadow refers to a spiritual entity associated a sinister world.

Each sentence is subsequently segmented by its major constituent syntactic phrasal categories, which are coded bottom up (step ii). Mostly "phrases" and "content words" were considered as units of analysis, that is, the level of detail was not totally fine-grained to the level of lexical components, but only to major syntactic phrases. A content word is a noun, verb, adjective or adverb whose main function is to express meaning, and a phrase is defined as "well-formed sequences of words" (Koopman, Sportiche, & Stabler, 2013). For example, one of the previous sentences (S2) was fragmented as follows:

- The character has a wooden leg (NP + AP)
  - *the character has a wooden leg.*
  - *the leg is wooden.*
- the character is actually a shadow (NP)
- the shadow is projected on different surfaces (VP)

This segmentation is done to all sentences, for the entire text of the annotation, in the case of "open texts" (*Classification No.5*). In the case of "formal" texts, this fragmentation was less necessary since the formal annotations were already given in small fragments in most cases

[82] Original in Spanish: "El protagonista, un hombre de mediana edad, bien trajeado, sigue a distancia los pasos de un personaje. Este personaje, caracterizado con una pata de palo, es en realidad una sombra que se proyecta sobre distintas superficies. Por el ambiente general del fragmento podemos interpretar que la sombra hace referencia a un ente espiritual asociado al mundo de lo siniestro." (Annotation output, participant 5, study B)

(e.g., tags, keywords); and in the case of "combined" texts, it was mostly applied to the open text part, and to keyphrases.

ii. *Initial open coding.* The previous segmentation to the 20 analyzed annotations resulted in a list of major conceptual constituents (i.e., the content words or content phrases) (n=551 words/phrases) that were coded or classified using the same procedures described in Section 4.7 (open coding + classification). The initial codes emerged through an analysis based on the semantic, or descriptive attribute conveyed in the meaning of those phrases (e.g., type of shot, director's style). This procedure is also similar to structured semantic analyses of major conceptual constituents, for instance in the analyses proposed by linguist Ray Jackendoff (Goddard, 2011, p. 60). For example, from the previous sentence, there are four resulting attributes:

- The character has a wooden leg
    - *the character has a wooden leg.* Objects and beings (traits)
    - *the leg is wooden.* Objects and beings (traits)
- the character is actually a shadow
    - Objects and beings (traits)
- the shadow is projected on different surfaces
    - Objects and beings (actions)

The resulting attribute list is called "*Classification No.7*-Specific attribute type" in Table 6.3. The final categories (e.g., "objects and beings (traits)", "camera movements", "color", etc.) are included in the thesis' "code book" (Appendix B). Besides the major attributes, in some cases, content and functional words were analyzed as "discoursive", since they conveyed attitudes or opinions of the annotation's author (e.g., the word "we could interpret", in S3 from the previous example, which acts as a discourse element that expresses doubt).

iii.*Categorization:* The previous specific attribute types were grouped into broader categories, which were the same ones used in Study A (§5.4.7) (i.e., *"cinematography"*, *"emotions"*, "explanations", "facts", and "other"). The resulting list is called "*Classification No.7*-Broad attribute type" in Table 6.3, and its categories are detailed in Appendix B. The classification criteria followed in Study A (§5.4.7) were used for grouping the codes/attributes that emerged from the previous step. In certain cases though the criteria established in Study A could not be used in the same way. The main reason is that while in Study A the tags were created in a time-based fashion, in Study B the annotations were created after the participants watched the clips or movies, which originated a greater number of keywords that applied to the entire movie or clip. For this reason, a new set of specific criteria that could be used in these cases was defined, and is detailed in the thesis codebook (Appendix B).

iv.*Normalization and quantification.* In this phase, each word/phrase was revised in order to assure that the code assigned corresponded to the resulting classification (*Classification No.7*). Finally, the quantitative analysis was done by using the percentages of the total number of phrases classified in each attribute in relation to the total number of phrases in the

overall annotation output.

iii.*Additional analysis. Granularity level*. In addition to determining the type of attributes being described, an additional classification was used in order to observe whether each attribute (phrase) applied to the movie as a whole or to the clip. The value list is called, "*Classification No.7*-Granularity level" in Table 6.3.

iv.*Interannotator agreement test:* The final set of annotation outputs (n=20, corresponding to annotations to the clip "Vampyr" (from Sim1 and Sim2) were manually classified by the author of this thesis using the procedures described above. In order to assure the consistency of the procedures and classification criteria, a sample of these annotations was analyzed by a second person, following the same procedure used in Study A (§5.4.7). The sample was a 20% of the total 20 set of annotations (n=4), distributed in 1 "formal", 2 "open", and 1 "combined" annotations. The procedure was done in two parts: first, there was a test for the segmentation task: the 6 annotations were segmented by the second person, and the Cohen's kappa (k)2 was used as a measure of agreement between both annotators (using the final number of segments), plus a manual check of the constituents of each segment. The agreement for the segmentation was good (k=0.68). Thus, the segmentation process was considered valid. Second, the resulting total number of commonly agreed segments from the sample was analyzed by the second person using the terms from *Classification No.7* (specific first, then broad, and finally, granularity level). The agreement was moderate for the specific type (k=0.57), high for the broad classification (k=0.85), and also for the granularity level classification (k=0.92).

–***Qualitatative analyses.*** The qualitative analyses were mostly performed for *RQ.2.3*, but also to understand the other *RQs* in the study. They were the following datasets §6.4.3.4): interview audio recording (c); questionnaire 1 (Parts3) (e); and questionnaire 2 (f).

The audio recording of the entire session was analyzed following the same procedure described in Section 4.7, that is, through "open coding." Because the emergent topics in the dialog were too numerous, the analysis had to be more focused as it progressed, mostly by coding only the elements that were highly related to the guiding research question (*RQ2.1*). For instance, when the following elements were discussed by the participants: type of annotation used in the first two tasks, the explanation of the scholar's choices for a specific type of annotation (whether they used tags, comments, summaries, shot listings, or any other form of annotation), the comments about the granularity level at which the annotation was performed, or about the specific attributes in which they focused, and to the several behavioral aspects identified in Chapter 3 (§§3.4.3; 3.6.1), such as familiarity with the source, previous experience with indexing, etc.

The researcher's observation notes (dataset b) were not fully coded but used as support for the analysis. Likewise, the questionnaires (dataset e and f) were not quantitatively analyzed, but used as supportive material in the analysis, for instance, to know whether a participant had already seen a movie (which was one of the questions in Questionnaire 1 –q21, Appendix

E), or to have more details about the participants' search behavior and background (from data provided as answers to Questionnaire 2).

6.4.5. Limitations

Because of the lack of studies in this area using simulated work task situations as data collection technique (§6.4.3.1), there were several decisions that had to be taken during the study's research design and may have influenced the findings. Those have been detailed in the previous sections with the aim of facilitating future studies. However, it may be relevant to highlight the most important challenges that should be considered. For instance, the design of the simulated work task indicating *"help others to find…,"* has a clear purpose of studying annotating behavior in the cases where there is an explicit need for facilitating future retrieval for others. Most precedent studies on image description have used the "future retrieval" indication as the motivator. Other options are to use simulated work task situations that are more realistic, associated to natural annotating tasks that occur during seeking or searching. Also, because the overall intention of this study was not to create quantitative generalizations but to find evidence support for interpretation, manual analyses were performed, but future work could also use and investigate the application of automatic methods of computational linguistics for this type of information-annotating studies (this idea is discussed in §6.7).

6.5. Findings and discussion

This section presents the findings to this study's research questions (§6.2). The findings section is divided into three parts that include: first, the analysis of the types of annotations created by the scholars (*RQ2.1*, §6.6.1). Next, the attributes of the moving images that were considered relevant for the scholars in their descriptions of the films (*RQ2.2*, §6.6.2). Finally, the analysis of the participants' perceptions of their own annotating and annotations-sharing behavior (*RQ2.3*, §6.6.3).

6.5.1. Annotation types and styles*[83]

This section presents the findings of this study's first research question (*RQ2.1*), which inquires about the types of annotations used by film scholars when assigned an information-annotating task in which the annotations are intended for future retrieval use. It includes the findings from the analysis of the first dataset, which consists of the total annotation outputs (n=50) created by the scholars during the two simulated annotating-tasks (§6.4.3.4, dataset "a").

[83] Until this point this thesis has used the term annotation "type." The concept of "annotation style" in this title is not discussed in this section, but later in the chapter (§6.6).

6.5.1.1.Broad and specific annotation types

According to the procedures explained in Section 6.4.4, the annotation outputs created by the participants could be classified into specific and broader types according to their form (e.g., if they were formal, such as in the case of tags; or if they were open textual descriptions; or whether they consisted of both types) (*Classification No.5*). The resulting types after analyzing all the annotation outputs are termed: "Formal text" (e.g., tag/keyword); "Open text" (e.g., review, critical synopsis), and "Combined". Figure 6.6 summarizes the broad annotation types[84].

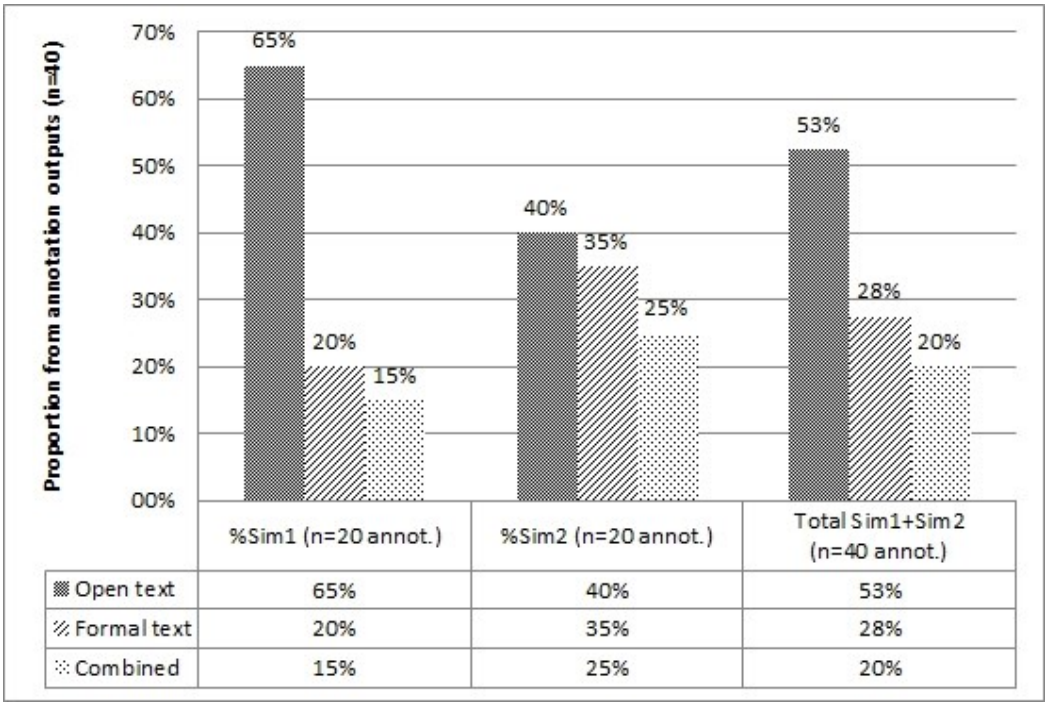


Figure 6.6. Distribution of annotation types in Sim1 and Sim285 (Classification No.5)

As it can be observed in Figure 6.6, participants mostly used open textual forms (65% in Sim1, and 40% in Sim2) when performing an information-annotating task in which the output is intended to be used for future retrieval purposes. These open texts include, for instance, plot outlines, film reviews, or critical synopses (§6.5.1.2). Indeed, in the first task (Sim1), when scholars could spontaneously choose any type of annotation, there was a clear preference towards using open descriptions, in comparison to more formal or structured texts.

Also, there was a more frequent use of formal annotations (35%), and a combination of open and formal annotations (25%) in the annotation outputs in Sim2 compared to the same types in Sim1. These formal texts correspond to concise or more structured descriptions, for instance, to tags/keywords (§6.5.1.3). Two factors may have influenced these changes in the

[84] Please notice that this analysis applies only to four of the total five film clips used in Sim1 and Sim2, since the control clip was left out (§6.4.4.1).
[85] Here Sim2 includes both Sim2-a and Sim2-b.

selection of an annotation type from open texts in Sim1 to formal descriptions in Sim2, which can be derived from the qualitative analysis: (1) the task itself, since Sim2 included a list of annotation options to choose from (which Sim1 did not have); (2) the fact that Sim2 included more precise information about the context of the task (i.e., education or research); and, (3) a change in the scholars' behavior in relation to familiarity with the task, and awareness of time constraints. In addition, it is also possible to indicate, based on the interview analysis, that scholars have different perceptions about the cognitive effort required for each type of annotation (open vs. formal texts, as will be discussed in §6.5.3.3).

Table 6.4 gives more detail about the specific types of open, formal, and combined annotations, and their frequency (it combines *Classification No.5*-broad and specific, §6.4.4.1). The terms used in this table are defined in Appendix A, and will be discussed in the next sections (§§6.5.1.2-6.5.1.3).

Table 6.4. Annotation types (Classification No.5-Broad/Specific)

Classification No.5	Total annotation outputs Sim1	%Annotation outputs Sim1	Total annotation outputs Sim2	%Annotation output Sim2	Total outputs	%Total outputs
Open text	13	65.0%	8	40.0%	21	52.5%
Review	9	45.0%	5	25.0%	14	35.0%
Synopsis, critical	2	10.0%	2	10.0%	4	10.0%
Plot summary	1	5.0%	1	5.0%	2	5.0%
Plot outline	1	5.0%	0	0.0%	1	2.5%
Formal	4	20.0%	7	35.0%	11	27.5%
Tag/Keyword	3	15.0%	6	30.0%	9	22.5%
Keyphrases + Tag/Keyword	1	5.0%	1	5.0%	2	5.0%
Combined	3	15.0%	5	25.0%	8	20.0%
Review + Tag/Keyword	2	10.0%	4	20.0%	6	15.0%
Plot summary + Tag/Keyword	1	5.0%	1	5.0%	2	5.0%
Total general	20	100.0%	20	100.0%	40	100.0%

The rich variety of annotation types created by the scholars, as shown in Table 6.4, will be discussed later in this chapter (§6.7). The most important types of annotations used according to Table 6.4 are described in the next two sections, including observations from the participants from questionnaire data.

6.5.1.2.Open textual annotations

One scholar suggested that some ideas can be expressed only by using synopses, and would not be expressed otherwise$_{(p8)}$, indicating that, contrarily to keywords, synopses (or other

open texts) allow the scholar to express ideas or opinions more freely. In order to understand the characteristics of the open textual forms better, an additional classification was applied to this type of annotations at the sentence level. For this, the open or combined annotations from the total outputs created by the participants (n=34 from 50) were classified using the most general and basic classical rhetorical modes of discourse following the procedures indicated before (§6.4.4.2): "argumentative" (if it makes a claim or assertion of something new, it involves opinion, and the author assumes a posture); "descriptive" (focus on specific objects, people, mental states); "informational" (basically providing facts as uncontroversial, with an educational or instructive purpose); and "narrative" (presenting a sequence of events). Table 6.5 shows the frequency of use of the different modes per open textual annotation type.

Table 6.5. Discourse modes adopted in "open textual" annotations (Classification No.6).

Anotation type / Discoursive type	**Number of annotation outputs**	**%of total annotation outputs (n=50)**	**Number of sentences / Mayor phrases**	**% of sentences in a discourse mode**
Review	22	44%	125	
Informational			56	44.8%
Narrative			30	24.0%
Argumentative			21	16.8%
Descriptive			18	14.4%
Synopsis (critical)	6	12%	31	
Narrative			11	35.5%
Descriptive			9	29.0%
Argumentative			7	22.6%
Informational			4	12.9%
Plot synopsis	4	8%	17	
Narrative			10	58.8%
Descriptive			5	29.4%
Informational			2	11.8%
Plot outline	1	2%	3	
Narrative			2	50%
Descriptive			1	50%
Storyline	1	2%	2	
Narrative			2	100%
Total general	34	68%	178	

The higher use of informational discourse in the most common type of open annotations (the reviews) suggests that scholars intended to keep a certain degree of objectivity (i.e., the "uncontroversial" mode of the informational texts), which may be due to the fact that both

tasks explicitly indicated the goal of facilitating future retrieval, and not, for instance, their use in advertising or criticism.

The analysis of discourse modes distributions in Table 6.5, plus the preliminary examination of current definitions of different types of textual annotations for films and media works performed during the analysis phase (§6.4.4.1), made possible to create a definition of the several types of open texts found in this study. The definitions can be created according to three criteria: the focus or not on plot description (prevalence of the narrative discourse), the presence or not of critical elements (presence or not of argumentative discourse), and their extension. Table 6.6 summarizes those concepts (their definitions are in Appendix A)[86].

Table 6.6. Different types of "open textual" annotations (Classification No.5).

Open text	Extension (in lines / approx. sentences –s-)	Focus on plot (narrative)[87]	Critical elements (argumentative)	Use of additional content elements
Storyline	One line (2s.)	Yes	No	No
Plot outline	Two to three lines (3s.)	Yes	No	No
Plot synopsis	Between three to ten lines	Yes	No	No
Synopsis	More than ten lines	Yes (detailed)	Not frequent	Background information
Critical synopsis	More than ten lines	Yes (detailed)	Yes	Background information, arguments or judgment
Review	Different lengths	Optional (may include any or none of the previous types)	Yes	Background information, arguments, and judgment

Next, those definitions plus the most important types of discoursive elements are analyzed in relation to each type of open text, starting with the most commonly used type according to Table 6.4 (i.e., reviews):

–***Reviews.*** There was a preference among the scholars for annotating the clips through reviews (n=44% of the total outputs, Table 6.4). There is no standard definition of what a film or media "review" is. Based on the previous analysis of annotation types and discourse modes, a (film) review is considered in this study as an open text which is predominantly informational, and incorporates critical arguments, although not necessarily focuses on the

[86] Participants also used their own terms to refer to their annotation outputs, for example: some called their outputs "critical texts", others indicated that they tried to describe the "story"*, or "topic"*, "theme"*, or "motif."* In this study "critical text" and "review" were considered equivalent. The other terms are discussed in Section 6.5.1.1, and defined in Appendix A.

[87] Bordwell and Thomson (2003, pp. 70–72) indicate that there is a distinction between "Story*" and "Plot*." In this table, the term "plot" is preferred; following Bordwell and Thomson (2003, p.70), it is understood as the explicit presentation of narrative events or "nondiegetic" elements. Usually the description of the "story" includes interpretation elements that are more often included in critical synopses or reviews.

plot (narrative or descriptive elements). Bordwell's (1991, p. 38) indicates that film reviews are composed of four elements: (1) a condensed plot synopsis; (2) background information (genre, director, production or reception details); (3) a set of abbreviated arguments about the film (opinions about the acting, story logic, sets, etc.); and, (4) a summary judgement (e.g., good or bad) or recommendation (e.g., see it/don't). As Bordwell explains, these components can be arranged in a different way, but still the possibilities of a film review can be condensed in those four points. Figure 6.7 shows an example of a (film) review provided by one of the participants.

> Se trata de una película en blanco y negro, probablemente en los albores del cine sonoro. Tiene una fotografía contrastada y expresionista. El sonido sigue la narrativa de continuidad y misterio que busca contar la escena. Tiene una música pautada y expresionista que dialoga con los sonidos intradiegéticos de campo y de perros ladrando.
>
> La escena comienza in media res, parece que se ha iniciado antes y presenta a dos personajes separados por un río. Claramente uno persigue a otro. Hay una breve caminata. El personaje más alejado no existe realmente, y sólo se ve la sombra reflejada en el agua. El perseguidor es un hombre trajeado. Llegan a un edificio grande, abandonado y destartalado, que se descubre con un plano que se mueve hacia la derecha. El hombre entra. Es la primera vez que vemos su rostro perplejo y un aspecto atildado. La sombra parece un hombre y vemos que es cojo, que tiene una pata de palo. Antes se ha visto también, a través de su sombra, que parecía desenterrar algo, en una visión invertida; apunta a la lógica invertida de este personaje. La sombra sube por unas escaleras; es una imagen clara a pesar de ser una ilusión. El hombre trata de atajar desviándose por un pasillo y, de repente, al fondo del mismo aparece, y avanza hacia él, un sacerdote ciego que se guía por un bastón.
>
> Dado el título y el desarrollo de la escena, estamos ante un clip de una película de intriga, o de terror.

Figure 6.7. Annotation example (Film review), Sim1, Clip1[88].

The previous example corresponds to one of the most common forms of reviews from a communicative point of view (i.e., informational and narrative, according to Table 6.4) identified in this study. By looking at the example more in detail, it is possible to identify three of the four elements of a film review described by Bordwell, and correlate them with specific modes of discourse:

[88]"This is a black and white movie, probably from the early years of sound film. It has a contrasted and expressionist photography. The sound follows the scene's narrative of continuity and mystery that is intended. The music, ruled and expressionist, dialogs with the intradiegetic sounds of the country side and barking dogs. The scene begins in a middle point, it seems to have started before, and shows two characters separated by a river. Obviously, one is following the other. There is a brief walk. The most distant character actually does not exist, only the shadow reflected in the water can be seen. The follower is a well-dressed man. They arrive to a big building, abandoned and ramschackled, which is displayed through a moving shot to the right. The man comes in. This is the first time hat we can see his perplexed face and his elegant aspect. The shadow seems to be a man and we can see that (he) is lame, that (he) has a wooden leg. It was possible to see before, through his shadow, that (he) was unearthing something, in an inverted vision; this points to the inverted logic of this character. The shadow climbs through a staircase; it is a clear image in spite of the fact that it is an ilusion. The man tries to intercept deviating through a corridor and, all of a sudden, at the end of it, a blind priest guided by a cane appears and moves towards him. Given the title and development of the scene, the clip belongs to a horror or thriller movie" (Participant Study B). Translation by this thesis' author.

- The first and third paragraphs present “background information” (element 2), it assumes an “objective” and informative tone, which corresponds to the “informational” mode of discourse.
- The second paragraph includes a detailed synopsis of the scene (element 1); it makes the plot explicit by introducing the events in a sequential order, enriched with descriptions of the spaces and characters. It was observed that not all reviews in the sample included this element.
- The second paragraph also includes interpretations of the film (about the acting, story logic, sets) which are embedded within the synopsis itself (element 1+3). In this sense, this component can be identified with a critical synopsis.
- The fourth element is missing. Indeed, recommendations to see (or not) a movie were absent in the complete analyzed sample; this is related to a non-frequent use of argumentative modes of discourse in the film reviews (16.8% of the sample included arguments, strong assertions or claims). Only in two cases the scholar wrote a “recommendation to the archivist,” indicating her/his opinion about whether it was worth to be archived or not, or an explanation of his/her familiarity with the source, indicating that the scholar had not seen the complete movie. It may be possible to conclude, that scholars do not assume the responsibility of attracting an audience to the film in any of the two tasks.

Moreover, in the sample, film reviews vary in length, from a few sentences to several paragraphs. In real film discourse, they are usually longer texts, usually published in specialized magazines. Finally, even though reviews are considered in this study as “open texts”, i.e., non-structured forms of annotations, there were two instances in the analyzed set of annotations in which the scholar provided an explicit structure (a kind of faceted description) of the internal structure of his/her text, that is, (s)he wrote a header indicating which aspects were being described, e.g., “general description” (followed by his/her description), “technical details”, or “synopsis” (see also Figure 6.9).

–***Synopses.*** As suggested above, the second paragraph of the example in Figure 6.7 corresponds to a synopsis which describes the actions that occur in the film/clip in detail. But in addition to that, there are opinion elements embedded alongside (e.g., the sentence: “it points to the inverted logic of this character”). All synopses in the sample included these argumentative elements, from a low to a high frequency (22% of the sentences in the texts identified as synopses in Table 6.5). For this reason, it is possible to propose a distinction between synopses and “critical synopses,” as suggested in Table 6.6, depending on the frequency of argumentative discourse.

Furthermore, some synopses are shorter and only focused on presenting the plot (so they are named “plot synopsis”, or “plot summary”), while other synopses additionally include informational elements, such as background details (about the genre, or director). Figure 6.8 shows an example of a plot synopsis.

> Fragmento en el que en Plano General aparece el interior del camerino en el que la protagonista mantiene una discusión con otra joven del circo. Al quedarse sola, enciende un puro. En ese momento se produce una ligera panorámica que nos muestra a un pequeño mono disfrazado que toca una campana. A través un cambio de plano por corte, pasamos a un Plano General Corto en el que la chica le habla y le pide que deje de tocar su campanita.
>
> Palabras clave: Camerino, Mono, Movimiento de cámara, Panorámica, Montaje.

Figure 6.8. Example of a plot synopsis for Clip 2 (Vampyr) Task [289].

The example of Figure 6.8 shows how the scholar combines narrative elements with cinematographic details that (s)he is able to observe and communicate as a result of his/her domain knowledge. Those are used with a communicative intention of explaining and describing, using a tone that appears as "uncontroversial" which is the characteristic of informative texts. The scholar also adds keywords, which are also informative in this case, making this text be mostly informational.

Synopses are different from **reviews**, not only in their incorporation of argumentative discourse but also in their attention to the plot. While synopses always include narrative elements, there are some reviews which may not have them. But **critical synopses** and reviews are closer in that they both include argumentative discourse. This consists of assertive opinions about the clip/film value. Since there were no texts that were solely "argumentative", an annotation output that included clear argumentative sentences is selected as an example (Figure 6.9). It corresponds to a text that was classified as combined (open text + formal text), in which the textual part corresponds to a very short review in which the discourse modes are: "narrative + argumentative (28.6% of the sentences) + descriptive".

> Resumen: Los trabajos diarios en una estación de ferrocarril con sus enganches y desenganches de vagones y locomotoras. El protagonista se enreda el pie en un cambio de agujas mientras un vagón se acerca. Aterrorizado, piensa en su vida: alguien ve el incidente y libera el cambio. El vuelve a casa y abraza a su hija.
>
> Comentario: Sin certeza pero este pequeño cortometraje de 6 minutos y cerca de 80 tomas es obra de un cineasta aficionado, seguramente con una finalidad didáctica. Tiene una estructura demasiado simple y muy poco elaborada, con un franco mal trabajo de suspense.
>
> Desglose: planificación clásica con algunos tintes constructivistas del cine soviético
>
> Etiquetas: Mundo laboral-ferrocarriles; Trenes-máquinas de vapor/vagones; Riesgos laborales.

Figure 6.9. Example of a combined annotation with a review that combines "Narrative/Argumentative" text for Movie 2 (L'aiguille), Task2, Study B[90].

[89] "Fragment in which the interior of a dressing room appears in a long shot, where the main character argues with another young woman from the circus. When she is alone, she lights a cigar. At that moment there is a little panning that shows us a small monkey disguized and ringing a bell. The shot changes through cutting, and we pass to a medium long shot in which the girl talks to it and asks it to stop playing the bell. Keywords: dressing room, monkey, camera movement, long shot, montage" (Participant Study B). Translation by this thesis' author.

[90] "Summary: The daily work on a railway station with their hooves and disconnectors of railway transport. The

The example in Figure 6.9 illustrates the open expression of opinion about the aesthetic quality of the piece. While this communicative intention may be common in film or media criticism, in this case, when the purpose was to support future retrieval, there is an explicit intention of separating what is "objective" information to what corresponds to the more opinionated description. This is indeed connected to the previous finding of the predominant use of informational texts in the overall sample. From the questionnaire data it is also possible to confirm the "objective" disocursive intention, since some scholars indicate their concern about the use of a "literary" language in the annotations, because these descriptions [that are intended to facilitate future retrieval], they say, should be done in a more technical or archival way$_{(p6)}$.

Scholars do not seem to agree on how critical (argumentative) a synopsis should be, as it is illustrated by the following opinions:

One scholar considered that synopses could play an informative role for non-domain experts, but that consequently in those cases they should have a clearer informational (instructional) intention. According to this opinion, another participant indicates that there are two types of synopses: one that is oriented to offer information for telling what happens in the movie (i.e., what is called "synopsis" in this analysis), and another one inviting to see the movie (i.e., what could match at some point to the definition of "critical synopsis" in this study, since it may include argumentative discourse). This participant chooses the first type for task 2$_{(p3)}$, which indicates her/his preference for informational texts. Likewise, another scholar comments that synopses may be problematic if they include subjective interpretations that can introduce biases (e.g., the case of the film "La Caza" by Carlos Saura, for which some synopses explicitly indicate the provenance of a group of dead bodies, that the director intentionally left open to interpretation)$_{(p7)}$. Her/his point is different from the other opinions above, though, adducing that writing objective summaries of a film is almost impossible, since movies do not explain everything, and there is always one part that the spectator has to build her/himself$_{(p7)}$. Conversely, another participant indicates that informational synopses that do not include argumentative discourse (i.e., an expert opinion about their value), may not be relevant enough for domain experts to judge relevance during searching$_{(p4)}$. This last argument is close to an observation by Stone (1982), who indicates that reviews may be more valuable for humanists; in her terms: "effective reviews are more useful than abstracts because they provide a framework within which the likely quality and relevance of an item can be judged" (Stone, 1982). Translating Stone's statement to the terms used in this study, critical synopses or reviews are more useful than synopses since they support relevance judgments based on an aesthetic or information object's quality.

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protagonist's foot gets entangled in a switch while a wagon is approaching. Terrified, thinks about his life: someone sees the incident and released the change. He returns home and hugs his daughter.
Comment: With no certainty, this 6 minute long short film of about 80 shots is the work of an amateur filmmaker, surely with a didactic purpose. It consists of a too simple and not elaborated structure, with a poor suspense work.
Breakdown: classical planning with some signs of constructivist Soviet cinema
Tags: World Labor-railways; Trenes-Steam / wagons; Occupational hazards.

Even though the opinions among the scholars are divided about what the preferred discourse mode in this type of open metatexts should be, previous research indicates that abstracts in the humanities may need to be of a different type than abstracts in the science literature. Tibbo (1994) analyzed the applicability of the ANSI/ISO abstracting standard (Z39.14-1979) to history abstracts, finding that more than fifty percent of the sentences in the analyzed sample did not match any of the content categories in the standard, and that the structure proposed in the standard was closer to abstracts in two scientific fields[91]. Similarly, indexing manuals generally indicate that the purpose of indexing is to provide useful information avoiding critique or subjective judgment, in order to help readers evaluate and select a document without requiring them to read the actual document (or watch the media in this case).

For this reason, other researchers have explored the creation of abstracts for "imaginative works" more in detail, as reviewed by Lancaster (2013), confirming indeed that the characteristics of summaries or synopses for this type of works should be different than for scientific texts. However, Lancaster agrees with the idea that "the purpose of these texts should be "to indicate to a reader whether or not he wants to read or view the item described" (p.211), as in the case of scientific texts.

As it was commented in Chapter 2 (§2.3.3), there are a few guidelines in cataloging standards about how to build plot summaries or synopses. The current version of the FIAF cataloging rules (Harrison & FIAF Cataloging Commission, 1991) for instance, indicates that a "summary" should be composed of two parts:

(1). An introduction outlining the plot, subject, or nature of the moving image, preferably including genre(s), time period(s), and location(s) of the events depicted, if appropriate.
(2). An expansion of the introduction. [This may include the nature of the shots used (e.g., close-up, long shot, etc.)].

One could conclude that an additional difference between reviews and synopses is that the first ones (because of their emphasis on informational and argumentative discourse) have a clearer intention to aid a mediating function while the second ones have a more clear intention of acting as representations or surrogates.

Moreover, in the sample, film reviews vary in length, from a few sentences to several paragraphs. In real film discourse, they are usually longer texts, usually published in specialized magazines. Finally, even though reviews are considered in this study as "open texts", i.e., non-structured forms of annotations, there were two instances in the analyzed set of annotations in which the scholar provided an explicit structure (a kind of faceted description) of the internal structure of his/her text, that is, (s)he wrote a header indicating which aspects were being described, e.g., "general description" (followed by his/her description), "technical details", or "synopsis" (see also Figure 6.9).

[91] The new edition of the standard (NISO Press, 2015) includes guidelines also for abstracting descriptive or discursive studies (besides experimental work). However, nothing is said about imaginary works.

To conclude this part, it seems that the communicative or discoursive intention of open textual annotations may vary depending on which kind of relevance support is intended during retrieval. Besides, this communicative intention also varies depending on the context of the creation of the open textual forms, for instance, a scholar indicates that there is a distinction between production synopses, distribution synopses, or archival synopses[92].

6.5.1.3.Formal annotations

In addition to the prevalence of open textual annotations, the analysis also showed the existence of formal texts, that is, of descriptions which are more structured or closed than the open textual forms. The three identified forms were: tags/keyword; keyphrase; and shot list. Table 6.7 shows examples of these types.

Table 6.7. Different types of "formal textual" annotations (Classification No.5)

Formal text	Extension	Example
Tags/keywords*	Two to four words	Dreyer, Carl Theodor Cine de autor Clasicismo y vanguardias Cine europeo nórdico
Keyphrase*	Four or more words	influencia del impresionismo francés (luces) Adaptaciones-literatura / Mitos-drácula Sombras como utilización expresiva de la iluminación no neutral
Shot list*	Long, structured texts	1.P.D.L de veleta (gnomo) 2.P.G.L del protagonista. En un lago mientras le sigue una sombra bajo el agua 3.Toma 1 4.P.G.C del P. frente al vano de una puerta en un jardín (… continues until 20th shot)

Next, the most important types of annotations described above are analyzed:

–***Tags/Keywords.*** In some cases, the annotation assumes the form of short phrases (two to four words), or single or composed words, which describe or convey an individual concept, thought, or opinion about different aspects of an information object (e.g., its content, its topic, its possible use, etc.).

This form of annotation can be analyzed from several perspectives, for instance, word composition or morphologic aspects[93]; meaning; or behavioral aspects involved in their creation (for example, the cognitive load required to create a tag as opposed to an open text).

[92] At one film archive visited by this thesis author (§4.6), it was possible to observe, for instance, that many synopses are made by personnel at the marketing and communication department and are used to attract the viewers to the archive's exhibition activities. These synopses are incorporated into the collection catalog, which is also used by researchers. As part of future research, it would be important to evaluate what the researchers' use of these synopses created with a clear promotional discourse is, and whether it would be necessary that several types of synopses (reviews) could coexist in the same catalog.

[93] As for instance done by Guy & Tonkin (2006) who studied compound tags; or Kipp and Campbell (2006), who studied functional and linguistic characteristics of tags.

In this chapter, only the last two aspects are investigated: the types of semantic attributes expressed by the tags (§6.5.2), and some of the behavioral aspects involved in their creation (§6.5.3.3).

In general, as an annotation form, tags or keywords seem to be preferred when the scholars need to be more "objective," since they usually do not include opinions(e.g.,p1).

–***Keyphrases.*** Keyphrases are longer keywords (approximately more than 4 words). These keyphrases, although not the most common form of annotation output, were more frequent in the scholars' preliminary notes. That is, while watching the clips, in order to remember what to include in their final text, their notes resembled keywords or keyphrases. One participant confirms that when (s)he used keyphrases, those were for sketches[94], corresponding to ideas that just occurred to her/him without having to think further about categories.

Keywords and keyphrases thus have the property of condensing rich meanings in a brief, telegram-like note that can be used for the same scholar to remember, or to send a message to a future user of a detail that should not pass inadvertently. In a way, they also seem to have the informational communicative intention that many of the open texts also had. For example, the keyword "no dialogs" is used by one participant to indicate that this represents a big (cinematographic) challenge in the movie that is described(p6). Finally, even though keywords and keyphrases were created as such, there is an awareness that open textual annotations are also rich in textual information and keywords that can be used for searching(p1).

–***Shot lists.*** Only one of this study's participants elaborated a shot list as an annotation for Sim2 (Clip 1 "Vampyr"). This type of annotation corresponds to sequence, shot-by-shot analysis or similar time-based annotations (as defined in §2.3.3)[95]. During Study C (Chapter 7), some scholars also commented on these formal analyses[96]. Their comments are included next, combined with those from Study B:

Sequence analysis is refined by in-depth shot-by-shot analysis(SC,p5). It is a detailed and demanding type of annotation in terms of time and domain knowledge. This detailed type of annotation is associated to a "close-reading" of films, media or television works(SC,p4). One experienced scholar in doing these analyses took 12 minutes of the interview session for creating a shot-by-shot analysis of a 1 min. 36-second clip (a fragment is shown in Table 6.7). (S)he commented that in her/his classes (s)he only asks his/her students to analyze a fragment of the movie "Un Chien Andalou," by Spanish director Luis Buñuel and artist

[94] "Apuntes" in Spanish.

[95] This study participants use the equivalent Spanish term: "desglose" or "minutado" (more common in television analysis). It is also called "breakdown sheets" in English, "sceneggiatura" in Italian, and one scholar also calls it with the French term "découpage"(p7).

[96] Because Study C the scholars were asked to comment on examples of fine-grained, time-based descriptions during the interview, those findings are included here. However, the study design is different than from Study B. For additional information on how these data from Study C was collected see §7.5.2).

Salvador Dalí, which is only eight shots long(p2). The comments by a participant from Study C agree with the previous scholar, in that close film analyses in an educational setting cannot be performed for the entire movie:

> "Even at the master studies level we only take three to five scenes (five is already a lot) to perform this analysis. It is possible, of course, to say something about a film in its entirety, but doing a close analysis is not necessary for the whole film (it is also boring for the students), and in a three-minute clip they still miss a lot of what happens"(SC,p5).

Another participant also explains that, when done in class, one of the students' tasks is selecting the fragments as an exercise in applying their knowledge and criteria, since students are trained to "learn how to see" and develop their own skills in identification and appreciation of stylistic features(p7). In addition, this selection is done not only because it is impossible to do a complete formal analysis in one course, but also because not all movies have a well-planned sequence structure(p2). In relation to education purposes, scholars have different views about the way to teach how to do the formal analysis. One critical participant insists in that there is no objective way to teach how to do this analysis(p2), and that there are no recipes that could be used in all cases(SC,p9), another scholar shares the same opinion, and provides stronger arguments by commenting that "teaching people analysis recipes is kind of a crime, because you kind of cut their viewing experience by doing that", "you have to be more open in the discussion", the scholar adds(SC,p9).

One of the participants from Study B performed an intensive annotation task for her/his doctoral thesis, analyzing a corpus of films to understand how a topic was treated. The participant followed a systematic coding process, using keywords and/or tags, to code spaces and actions that were related to her/his topic(p3). In the year in which this happened, the time-coding activity had to be done on-site (at the film archives), or after big efforts for obtaining video copies, since there were only analog prints that could not be watched in detail for preservation reasons(p3).

There are also publications by renowned authors that consist of these formal analyses, for example, the French series "L'avant-scène-Cinéma"[97], which still exists(SC,p1). Scholars with a focus on film analysis actually use those publications, but at some point, when they start working on their own analyses, it is not necessarily an advantage to look at them(SC,p1), scholars need time to look themselves at the film(SC,p10): "there is a tension between the production of this kind of descriptions and the research you are doing"(SC,p1). One participant reflects on this activity of creating shot descriptions, suggesting that this method is "paradoxical," since pausing a moving image is against the essence of movement implicit in it: we pause in order to say something about it, says the scholar(SC,p5). Participants agree that this method, coming from structuralistic approaches, is time-consuming (as discussed in §2.3.3).

[97] This publication started in 1961 and to date still exists (2015): "Chaque numéro de Avant-Scène cinéma(rw) est consacré au découpage d'un ou deux films (avec dialogue complet, affiche, distribution, photos du film, analyses et autres informations). On trouve également toutes les critiques de la presse parus à la sortie du film. Si la place le permet, on peut aussi trouver un supplément photos d'un film sorti (avec synopsis)."

But, as one participant indicates, not all film or media scholars need to perform this analysis(SC,p5) or not always a great level of detail is required, even for research purposes(SC,p4. (this issue will be discussed further in Chapter 7).

Even though shot lists are formal descriptions, and similarly to keywords or tags may have an objective and informational communicative intention, a scholar remarks that this objectivity cannot be achieved, since, as (s)he comments: "every description is produced with a specific question in mind, even if it is not very conscious"(SC,p1). Another participant confirms this idea, (s)he says:

> "When people describe something in detail, the question is from what perspective: do they describe content factors (plot lines, story)? If that is the case, I think it is totally useless for any cinema analysis. Or do they have a sensibility for picture and composition? Or for transferring something that was three dimensional into something that it is two dimensional? If someone has the sensibility towards what the camera can do in itself, I think it could be a useful tool for discussion, but not as a model for analysis. Everyone has to find his or her own way to look at films and has to decide how deeply one is involved in the pictures"(SC,p9).

The ideas above, about objectivity and self-involvement in the analysis (and thus the creation of subsequent annotations/texts) are related to some of the scholars' skepticism about the advantage of using automatic shot detections(e.g.,p2;SC,p1). The argument presented by one of the doubtful participants is that the identification of a type of shot depends on the scale that is used within one film (which is not the same for all films or directors, and also varies in time with historical changes in styles, formats, and composition)(p2). One example that the participant presents is the style of director Theo Angelopolous, who in his movie "Landscape in the midst" (1988), does not use any figure shot[98], instead using a scale that goes from long shots to big long shots. The scholar insists in that there is not something like an objective scale of types of shots, but that this scale changes depending on the director or movie. (S)he insists that automating the recognition of shot scales is not possible due to these variations, but mostly because of the relationships that each director establishes between the different types of shots in a single movie(p2).

One scholar sharply summarizes the previous problem indicating that there is a tension between striving for objectivity, which is characteristic of the description and technical "instruments" side, and the analysis work of the scholar, on the other side, since in the second case this has to be done as part of their own interpretation (close reading) process(SC,p1).

In both studies (B and C), scholars did not mention to be using any information system to support them either in shot identification or during shot analysis to write their time-based annotations. Only one scholar refers to the difficulty of evaluating his/her students' shot analyses, because, (s)he says, there is not a good way of combining text and moving image yet, so (s)he needs to use the exact copy that the students used in order to correct their

[98] "Plano de persona" in the original Spanish record.

analyses(SC,p5).

Indeed, this problem of copies and versioning is one of the main concerns in the normalization work by the W3C working group on media fragments discussed before (§2.9). Once more, there seems to be skepticism in relation to this normalization, as evidenced by one of the participants' comments about the lack of universality in time codes, and his/her own problematic experience when changing to another format (e.g., DVD) or player; (s)he assumes then that they are only an indication(SC,p5). This is also related to the problem of copy identification that will be commented in Chapter 7, where it is suggested that in order to make time-based annotations shareable, there must be a clear preliminary identification of the film and copy that is being annotated.

After having analyzed and defined the annotation types provided by the scholars in relation to their form and communicative intention in this section (§6.5.1), the next section explores them at a more detailed level, by looking at the specific semantic attributes conveyed in the scholars' annotations.

6.5.2. Moving image attributes

This section presents the findings of this study's second research question (*RQ2.2*), which inquires about the types of attributes of the moving images that are relevant for film and media scholars when assigned an information-annotating task in which the annotations are intended to be used for future retrieval. It includes the findings from the analysis of one part of the first dataset, which consists of the annotations created by the scholars during the two simulated annotating-tasks (§6.4.3.4, dataset "a"), corresponding only to Clip1 ("Vampyr") in both tasks (i.e., n=20 annotation outputs). In this analysis, each annotation was segmented into the smaller meaningful constituents, which resulted in n=597 units (phrases or content words). Each unit was subsequently coded using an attribute classification (*Classification No.7*) composed of specific attribute types (e.g., "theme or topic", "sound", "shot types") and broader categories (*"cinematography"*, *"emotions"*, "explanations", "facts", "other"). These terms are described in Appendix B. The analysis procedures of text segmentation and phrase categorization are detailed in Section 6.4.4.

6.5.2.1.Broad and specific attribute types

This part of the findings presents the analysis of use frequencies of the semantic attributes described above in the annotation outputs to Clip 1 ("Vampyr"). The segments that corresponded to discoursive elements (n=68) (e.g., "probably", "one could interpret…") were left out.

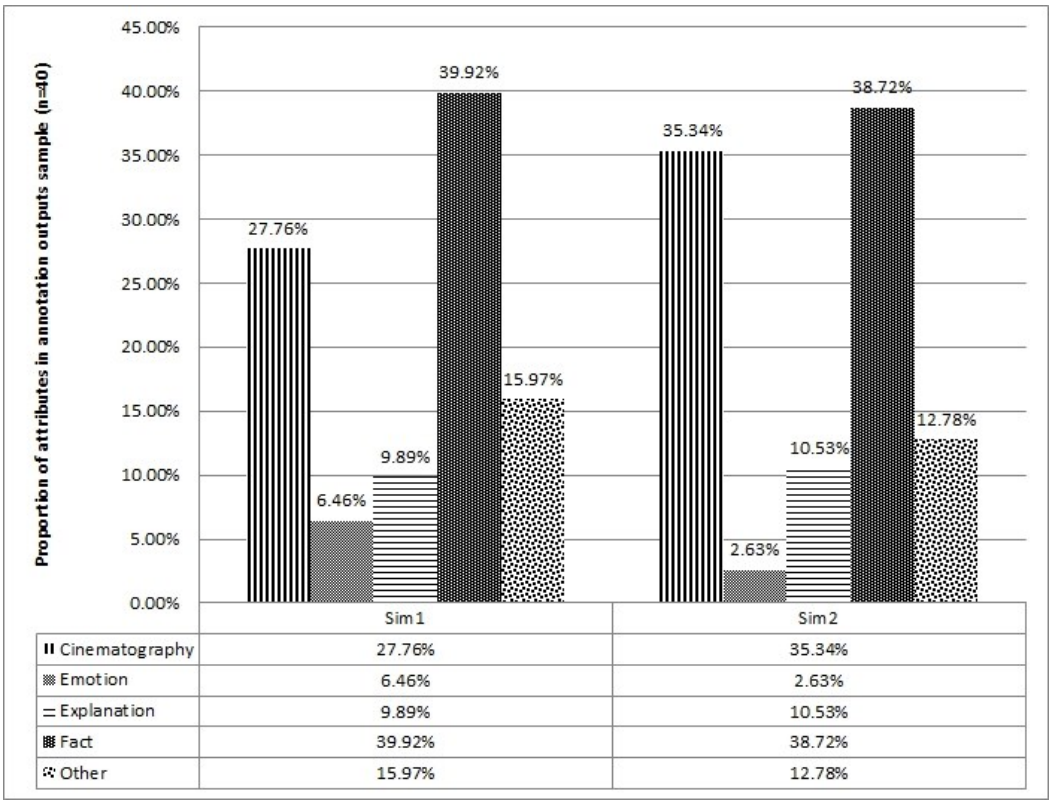


Figure 6.10. Proportional distribution of annotations' attributes across different semantic categories (Classification No.7, Clip1: "Vampyr")

Figure 6.6 shows the distribution of the different types of semantic attributes in each simulated annotating task using *Classification No.7*. There are no statistically significant differences between the two tasks in this aspect. Only a slight reduction of the *emotional* attributes in the second task as compared to the first one, and a tendency to have more *cinematographic* elements in the context-aware task (Sim2) than in Sim1. This may indicate that knowing the context of use and users of the annotation influences the selection of attributes.

Table 6.8 shows more details of these distributions, as well as the types of specific attributes used in each semantic category.

Table 6.8. Types of attributes and semantic categories in Sim1 and Sim2[99] (Classification No.7, Clip 1: "Vampyr")

Classification No.7 (Broad)	Sim1		Sim2		Total		Example of specific attributes
	(n)	(%)	(n)	(%)	(n)	(%)	
Fact	105	39.92	103	38.72	208	39.32	characters (actions)
Cinematography	73	27.76	94	35.34	167	31.57	shot types; sound; soundtrack; aesthetic

[99] Here Sim2 includes both Sim2-a and Sim2-b. The complete results related to the specific attributes are included in Appendix H.

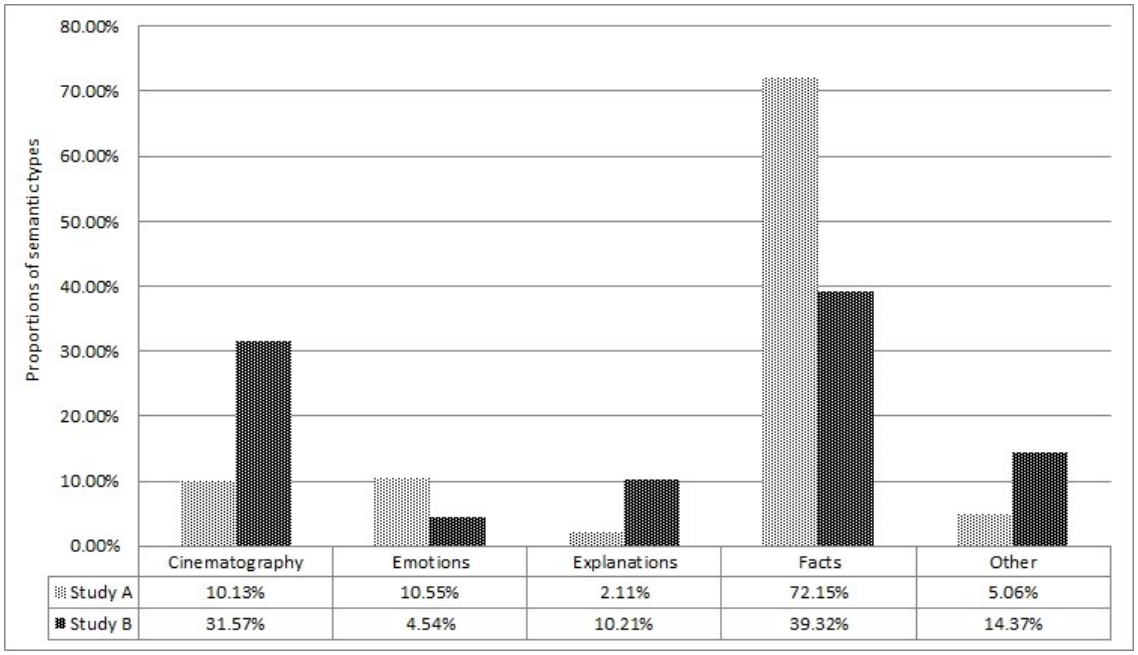
							movement; light
Other	42	15.97	34	12.78	76	14.37	unit of analysis or relation to movie; director; historical information; year or country of production
Explanation	26	9.89	28	10.53	54	10.21	theme or topic; genre or type; interpretative clues (about the characters or purpose of the film); historical value; potential uses
Emotion	17	6.46	7	2.63	24	4.54	atmosphere; characters' or objects' emotions, or spectator's mood
Total general	263	100	266	100	529	100	

The results presented in Figure 6.6 and Table 6.8 indicate that film and media scholars used a wide variety of attributes to describe the moving images in their annotations.Combining the distribution in Figure 6.10, and the specific attributes in Table 6.8, it is possible to conclude that most attributes focus on the *"Facts"* category, i.e., the *factual* aspects of the moving images. These aspects include for example: naming the characters (e.g., "the main character…", "a student…"), providing descriptive elements of traits (e.g., "a young man…"), or to their actions (e.g., "the character follows…". *Factual* elements also include naming objects, places, beings, or types of objects or beings. Named characters and their traits or actions were the most frequent specific attribute used by the participants (14.45% in Sim1 and 10.53% in Sim2 of the *factual* tags).

This result is in line with the concepts of film theoretician David Bordwell (Bordwell, 1991)who analyzed a series of "text schemata" which are recurrent in film criticism. Those schemata, explains Bordwell, apply at different levels. One of those levels corresponds to the "anatomy of narrative structures". In studying this patterns, Bordwell identified that most interpretive texts have characters (fictional or not) at the center, making them the focus of the description of actions and relationships.

The previous result, indicating the prevalence of the *"Facts"* semantic category, is similar to Study A, in that the experts (scholars in this case) mostly focus on *factual* aspects of the moving images. However, an important difference with Study A (comparing the general distributions shown in Figure 6.10 to Figure 5.2) is that in Study B there is a smaller proportional difference between the *"Facts"* and the *"Cinematography"* semantic types. Indeed, in the overall results of study A, the difference between the facts and the cinematography categories ranged between 58.67% and 71.43%, while in the sample analyzed in this study the difference is only 12.16% in Sim1, and 3.38% in Sim2. To observe this difference more in detail, the frequencies of tags' categories in Clip 1 ("Vampyr") from

Study A, created only by experts (in that study there were also domain novice tags), were analyzed against those in Study B. Figure 6.11 illustrates this comparison.



	Cinematography	Emotions	Explanations	Facts	Other
Study A	10.13%	10.55%	2.11%	72.15%	5.06%
Study B	31.57%	4.54%	10.21%	39.32%	14.37%

Figure 6.11. Comparison of semantic attributes' distributions in Study A –domain experts– and Study B for the same Clip, "Vampyr."

Although there is no statistically significant difference in the distribution across semantic categories between the two studies (after a non-parametric Mann-Whitney test for independent samples), it is possible to observe in Figure 6.11, that in Study B there is a slight tendency to include more *cinematographic* attributes to the annotations. Taking into account that the predominant form of annotation was textual, as described in the previous section, it is observed that the *cinematographic* attributes do not necessarily appear always in separate sentences or paragraphs, but also embedded in the sentences that also predominantly present a descriptive or narrative discourse. Examples of these sentences are included in Figure 6.7 and Figure 6.8.

This way of mixing different attributes in the sentences also occurs in the case of the "Explanations" category (which is also more frequent in Study B than in Study A). These *explanations* correspond to information that provides interpretive clues, or intertextual relations (e.g., indicating when a film is an adaptation of a literary work), extratextual connections (e.g., listing relations to other films or artworks), or potential uses for a given community. Interpretive clues were often attached to the descriptions, intending to call the attention of the reader. This emphasis on interpretive elements is evidenced by the use of discoursive terms (n=68 phrases, 11% of the total segments analyzed in this sample). These terms include for example: "is able to transmit", "it is interesting to observe", "as a representation of", "probably he wants to show", "it exemplifies", "it updates the tradition of", "it is a clue", "it inherits techniques of", "it is subject of debate", etc.

In relation to the perception about the use of these *explanatory* elements in the scholars' texts created during the tasks, a participant comments during the interview that *"Explanations"* and *"Emotions"* belong to the realm of the scholar's work of interpreting a film$_{(p1)}$, meaning that they should not necessarily be created to be used for retrieval purposes. Likewise, another scholar complements that *"Explanations"* could be useful [for the test's task] if they were kept at an informative level, but not going to a further symbolic or interpretive level$_{(p4)}$. These conflicting opinions relate to the discussion about whether synopses or other annotations should include argumentative discourse or not.

Moreover, *explanatory* elements may also depend on the specific content characteristics of the source itself. One important conceptualization for distinguishing which types of content require more fine-grained annotations at this level is that of Barthes (1974, as cited in Rafferty & Hidderley, 2005), of "writerly texts" and "readerly texts." In this distinction, some texts would have a higher degree of openness to be interpreted, inviting the reader to be involved in interpreting them (i.e., writerly texts), while others are presented as controlled and closed, and "the reader is positioned as a relatively passive receiver, and the text tends towards 'a' meaning" (i.e., readerly texts).

Finally, one participant remarks that none of the semantic categories presented above are as important as the historical and contextual information about the movie as a whole$_{(p10)}$. This information corresponds to the attributes that were classified in this study in the *"Other"* (broad) semantic category. Indeed, as the scholar suggested, these *other* non-content related elements may be essential in the scholars' descriptions (even more important than *emotions* and *explanations*, as it is observed in Figure 6.6). This common use of historical information for describing the films or clips is directly associated with the domain knowledge of the scholars, and in some cases can only be interpreted by themselves, using their expertise. For example, a scholar chooses not to add the keyword "silent film," since (s)he is conscious of the problems of this term among scholars, but adds the year in which the film was made as a keyword instead, explaining that "the specialists will know [which the characteristics of this film are] being from that period"$_{(p6)}$. Indeed, several scholars agree in that providing country or geographic origin information, plus the year of production, is fundamental, and sometimes even enough, for other scholars to identify the source. Associated to this, other elements such as aesthetic movement, director, or genre, to locate the film in its historical or stylistic framework are also considered relevant.

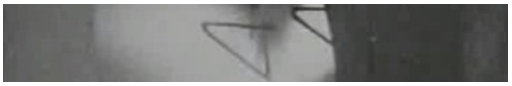
Even though the stylistic features (in the *"Cinematography"* category) are considered essential for describing a film to other scholars, they may not be so necessary to be created for non-domain experts to be read, a scholar indicates. As (s)he explains, depending on the public, these aspects should even be hidden or expressed in a certain way so that they do not scare away the public, instead of inviting them to see the movie$_{(p4)}$. Conversely, for film and media scholars the plot itself may not be so interesting$_{(p5)}$. Another scholar indicates that even for most experts, it is difficult to identify a shot from the stylistic features alone, and that objects of plot elements are necessary for shot identification$_{(p6)}$. Likewise, in the context

of teaching, a scholar indicates that both aspects (narrative and film language) should be combined$_{(p3)}$, while others consider that cinematographic language should have priority$_{(p2)}$. In Study C, a scholar explains that in a shot-by-shot analysis they may use terms for setting, characters, action (what is happening), significant objects, motifs, crosscutting$_{(SC,p5)}$ which indicates that the frequency of use of *cinematographic* aspects depends on the task's context.

Furthermore, film-specific attributes (e.g., *cinematography* elements) may or may not be required depending on the type of archive, as a scholar from Study C explains. (S)he participated in the construction of a film thesaurus as a domain specialist together with curators and librarians, trying to create a common thesaurus for both the television and the film archive. One of the main difficulties described by the scholar was to harmonize the interests of the television archive (for non-fiction documentary materials) with those of the film archive, in which the attributes needed for describing fiction films called for a more detailed terminology for genres and aesthetic terminologies)$_{(SC,p10)}$.

In the cases in which the scholars focused on the films' narrative description, it was common to observe a classical Aristotelean order of set-up, confrontation, and resolution (although these structures were not analyzed in detail). However, many scholars avoided introducing "spoilers" in their synopses, although a few did. An interesting example of the use of "spoilers" corresponds to the last part of Clip1, in which a person appears suddenly in the scene (Table 6.9). A common term to refer to the character in the figure was "old lady", but the scholars also used other terms (observed in that table on the right side next to the frame). Many scholars who had seen the complete movie "Vampyr" or knew about it[100], did not have a problem in identifying what this character actually was in the film (i.e., the vampire[101]), but they were not sure whether using the specific term (i.e., "vampire") or a generic abstract term (e.g., "strange character") in order to avoid introducing a spoiler[102], as some of them explained in the interview.

Table 6.9. Frame of Clip1 ("Vampyr") and examples of tags (Study A) and phrases/words (Study B) for the same shot.

	**Phrases/Words Study B**	**Tags Study A[103]**

[100] N=4/10 scholars had background knowledge about the film or had seen a fragment, but not the complete movie, and did not know what this figure was. N=5/10 had seen the movie and knew it quite well, but in some cases avoided mentioning the specific term. Only one participant said to have heard about it, but was not familiar.
[101] This thesis' author apologizes for introducing a spoiler herself...
[102] More details and examples about the "highlighting" role of spoilers in film reception is presented by Gray, 2010.
[103] These tags are included for comparison purposes, they were created during the "Waisda?" video labeling game in Study A.

	·Blind monk ·Monk ·Strange character ·Old lady ·Possessed old lady	·Blind ·Hermit ·Lady ·Monk ·Mysterious woman ·Old lady ·Old man ·Old woman ·Person ·Shadowy figure ·Vampire ·Woman ·Woman in robes

The example in Table 6.9 also shows the kinds of problems that automatic content-based retrieval (§2.4) systems try to solve. In this case, identification based on shapes and color composition may be too difficult, due to cinematographic style in this film based on shadows. In addition, an automatic shape detector most likely can identify the shape of a human person in this frame, but providing high-level abstract concepts such as "possessed old lady" would represent a bigger challenge. Similarly, the example shows the kinds of problems that tagging systems also face. The most obvious is the issue of perception. Not even in the case of factual tags it is possible to express "objectively" what an image is "of", as in this case. This is a common problem of linguistics and the cognitive perspective in IR research[104]; indeed, as Sowa (1984) said: "books, movies, and television create a superabundance of possible worlds, fictionalized histories, and imaginary futures", this makes language richer and more elusive to normalizations needed for information retrieval in other domains.

Even though, instead of normalization, other methods of linguistic or semiotic analysis may be more relevant to detect patterns that could be useful in retrieval or in guiding the annotation process. One approach is to distinguish categories of semantic attributes that need to b included in open/textual descriptions. For instance, similarly to the structures studied by Bordwell (1991) described above (§6.5.1.2), Lancaster (2003, p.214) suggests that the use of certain textual structures could guide the annotation of fiction works. Those structures are similar to structured abstracts, Lancaster explains, and often include four elements: plot, characters, themes and meanings, and critical context. Pejtersen (1979, 1984, as cited in Lancaster, 2003, p.205) suggests four major "dimensions" of a fictional work: subject matter, frame (time, place, social environment, and profession), author's intention or attitude, and accessibility. Pejtersen (1994), in the domain of fiction retrieval, proposes a model for fiction analysis (both for open and formal texts) that requires the analysis of the author's intentions, and the inclusion of "cognition information," based on the author's attitude, paradigm and intended emotional experience.

Even though the elements proposed by Pejtersen for the description of subject matter of

[104] E.g., the "Japanes text case" explained by Ingwersen and Järvelin, 2005, which illustrates how cultural context and cognition influence interpretation.

fiction books seem to be applicable to the domain of fiction films (even though she advocates for the need of objectivity from the indexer) one important barrier to her proposal is the level of knowledge (or time to get familiar with the film) that the indexer would require. However, these proposals for text structures could be useful to model user contributions in a *crowdsoucing* or *nichesourcing* setting. Indeed, most of the elements suggested above were included in the descriptions created by this study's participants (e.g., characters; author's intention).

To finalize this section, another important issue that arises from the example in Table 6.9 is the importance of granularity levels in the annotation tasks. In the case of the prevention of the scholar to introduce a spoiler in his description (using the tag "vampire"), her/his concern clearly applied only to the clip (scene) level, since the same scholar used with no doubt the title ("Vampyr") when (s)he was referring to the movie as a whole. The next section presents the findings related to these granularity levels.

6.5.2.2.Granularity levels

Besides the semantic attributes presented above, participants were aware of the level to which their descriptions applied (i.e., if they gave account of the entire movie, a sequence, a fragment, or a clip –i.e., the clip selected for the test). Several participants asked for this detail to be clarified before performing the task$_{(e.g.,p6)}$.

In order to observe the distribution of the attributes in terms of the level to which they applied, each attribute from the sample used for *Classification No.7* (529 phrases or content words) was classified according to two basic levels: movie and clip. Table 6.10 shows the results.

Table 6.10. Granularity levels for Clip1 (Sim1 and Sim2a-Sim2b)

	Sim1		**Sim2**						**Total**	
			Sim2-a. Education		**Sim2-b.Research**		**Total Sim2**			
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**N**	**%**
clip	199	75.67%	151	88.30%	24	25.26%	175	65.79%	374	70.70%
movie	64	24.33%	20	11.70%	71	74.74%	91	34.21%	155	29.30%
Total	263	100.00%	171	100.00%	95	100.00%	266	100.00%	529	100.00%

Table 6.10 shows that there was a variation in the unit of analysis being described according to the task. For instance, in Sim1, where no context was provided, the most annotated level was the clip (not the entire movie). In Sim2, this was also the case, but with some differences. It is important to recall that in the study's set-up (§6.4.3.1), Sim2 (as opposed to Sim1) indicated the use context for the annotations, and that Sim2 had two variants for that context: education (Sim2-a), and research (Sim2-b). It appears that while for both Sim1 and Sim2 (overall) participants focused on describing the clip as the unit of analysis, this was not the same in Sim2-b. Even though it is not possible to establish generalizations from the small

data sample, this may be an issue to investigate further, that is, whether in research contexts details about the film or media "work" (the entire movie) are of more importance (Chapter 7 will also explore this issue).Indeed, one of the scholars in Study B claims that fragments are not autonomous entities and that what can be seen in the fragment could eventually be interpreted, but it needs contextualization of its surroundings (what happened before and will happen after)$_{(p5)}$.

6.5.3. Annotating behavior

This section presents the findings of this study's third research question (*RQ3.1*), which inquires about the attitudes and perceptions of the scholars towards their annotating behavior during the tasks, and about their perceptions in relation to sharing and using social annotations.These findings are obtained by combining the categorization and analysis from the coding of the main dataset used for this section (dataset a), that is, the audio recording of the entire interview session. This was complemented by the researcher's observation notes (dataset b), and the data provided in the two questionnaires (datasets e, f) (§6.4.4.4)[105].

6.5.3.1.Observable behavior

From the researcher's notes of the participants' observable behavior during the annotation tasks (Sim1 and Sim2) it is possible to derive that a common behavior among the scholars was to make use of the options of pausing the clips, replaying them, and being able to write down notes while watching them. These activities, even though they look simple, are only possible to be performed after video copies became available$_{(p3)}$ to researchers. Some scholars pointed to this difficulty in previous decades when they had the chance to see a film only once$_{(SC,p5)}$.

Another observable behavior corresponded to the immediate request for extra information about the task. Most participants asked for more details about the purpose, the expectations about their outputs, or asked questions to confirm whether what they planned to do was correct. This observation is in line with the need for clear instructions during annotating activities that was found in Study A, both in the case of novices and experts (§5.5.3). Besides, other studies have also found that the lack of direction in *crowdsoucing* activities is a common pitfall of those projects (Noordegraaf et al., 2014).

Another recurrent request from the participants was for more information about the clips/movies after receiving the task description and technical details. Some of them asked more details about the director, or about the reasons why it was selected. Also, during the writing process of the annotation output, scholars would search online for more details. As it

[105] Because answers from Questionnaire 2 overlap with Study C's research questions, the findings as such are reported in Chapter 7 and only used here as support for the analysis. Correspondingly, when there are important findings from of Study C that are relevant to Study B, those are used in this chapter, indicating the crossreference or adding the citation to the participant's quote that was used.

will be commented later, all this makes part of an effort to become familiar with the source and/or to contrast their intuitions with the aim of assuring quality in their annotations.

6.5.3.2.Experience and knowledge of indexing

One of the factors that seem to have influenced the participants' annotating behavior was their previous experience with indexing or cataloging. Indeed, some participants had worked on professional information processing tasks: three of the ten participants in this study had worked at film archives or the like (e.g., graphic archives), having the responsibility of adding keywords and/or creating synopses, or were archivists before becoming scholars. Also, one of the participants had a master degree in audiovisual documentation*, and another scholar was the owner of a video library. In Study C, also three of the fourteen media researchers had this kind of experience since they were part of research projects at film archives which involved cataloging/indexing and/or interpretation and evaluation of specific collections and materials. One of them$_{(SC,p10)}$ participated in the construction of a film thesaurus as a domain specialist together with curators and librarians. A participant from Study C also participated in the "Archimedia-European Training Network for the Promotion of Cinema Heritage", who organized together with FIAF a program to train researchers on film preservation, cataloging, and indexing. The program ran from 1997 to 2004.

In addition to that formal training and experience, it was observed that during the video labeling game activity (Part 3 of the interview session of Study B, §6.4.3.2) various participants were concerned about the "matching" mechanisms$_{(p1)}$, or about the problems related to subjectivity and lack of agreement$_{(p6)}$. One scholar commented that tags were not needed anymore, because full-text retrieval would work by using their synopses written in natural language. This adds to comments by other participants who indicate a level of awareness among themselves of the principles of information processing and retrieval mechanisms$_{(e.g.,p1)}$, about the role of keywords in databases, and the need for controlled vocabularies$_{(p6)}$.

In sum, it is important to consider that domain expertise may be combined with indexing expertise (or IR stewardship, as it was defined at the end of §3.5.1), and that this has implications for the design of *nichesourcing* projects and systems.

6.5.3.3.Cognitive factors

One of the main aspects that influences information-annotating behavior (in terms of outputs, reactions, or decisions) is associated with the expertise and background knowledge of the participant, and to the mental processes that take place during classifying, describing, or communicating knowledge. As previous investigations (e.g., Bowker & Star, 2000; Soergel, 1986) have shown, finding patterns, classifying and categorizing is as important to the work of the scholar, as it is also for the information professional, although they have different purposes.

A scholar comments in relation to categorization activities: “it is part of my profession, it’s what I do all the time”(p1). The discipline is also composed of categorizations: “film scholars have already ‘tagged’ cinema”(p1) the scholar comments. The interpretation of a film (and thus its annotation or description) is linked to identifying stylistic traditions, influences and relations with other films(p2). There are pre-established terminologies that experts on a certain topic or period have in common and will probably use in their annotations(p6). Finding a trait of a film that does not fit those predefined categories can trigger research(p4), or awake fascination and interest for those films that do not follow the patterns(p5). One participant suggested that “expert knowledge is about having the capacity to distinguish if something is exceptional or not”(p6).

Being able to identify a film and a director in the context of film history is one of the main skills that a film expert has(p1) (see also §7.6.3.1). Scholars rely heavily on their own memory and knowledge of the film works they previously had or of the sources to locate them(p3). Intuition is also fundamental(p6). In the cases in which they lacked this initial identification of the source (for lack of data or familiarity with it), their domain-specific knowledge works as a “toolbox” to build meaning(p5). Also, the expert’s cultural background and background knowledge is linked to his/her domain specific knowledge and works in combination with the interpretative processes. During the interview, the reactions and talking aloud from the participants often involved guessing about characters’ identities and the meaning of certain events(e.g.,p1).

The annotating tasks in this study explicitly asked scholars to annotate for other people. Thus, they became aware of the annotation process and in most cases perceived it something difficult and challenging.

A conflicting cognitive factor of the tagging activity and in general, of the moving image description tasks, is that there is a need for objectivity and reduction which does not match with the work of the scholar, since closed categories may be too broad or manipulate the meaning and future use (for instance saying that a film is about “genre violence”, while another is not, even though the latter could be even a more subtle and critical work about it)(p2). Categorizing is also challenging for scholars since they have a high perception of nuances(p2), they also need discussion and comparison with other sources, or dialog with other scholars to debate and agree on possible film categorizations(p9).

In general, interpretation is a complex process in which several elements play a role. Being a film scholar means a way of seeing that combines domain and non-domain knowledge, experience in having seen a lot of films, and having a good memory. One example of what the scholar thinks aloud when (s)he sees an unknown scene is described next:

> “There seemed to be a change in the framing when the reel finished, the raccord and the shot size are not the same, there is a change in the angle, and it seems that the style of a single shot without using editing, but because I have not seen the full movie I cannot assure this… but in this year [1912] there was a tendency to use dramatic effects aided by editing, that is why I hesitate that this Danish movie

> [would be constructed like this], also, the clip is not representative of the whole film"…(p9)

Experience and 'cultural capital'[106] help scholars finding clues, at least in an initial stage, that later requires verification for other experts, for example, a film scholar may think that a film includes music by Brahms, but to confirm this will need a musicologist or an expert on Brahms, and this happens with other cultural elements(p1). In the annotation activity, this verification need is more pressing and is also done through other sources: **searching for information** in order to annotate the clips/movies was one of the most commonly observed behaviors, both to inform themselves and to obtain support for the arguments they will write about(p3).

This comes from a recurrently observed need of **contrasting** with what other members of the film community have found(p8), or how a film has been included or not in certain collections. One participant suggested that the collection which the clip (or film) belongs to also gives her/him clues of whether the features that (s)he found relevant should indeed be taken into account. For instance, as other participants, (s)he perceived that the clip "L'aiguille" was somehow amateurish, if this movie was in a collection for researchers, she would be able to contrast this preliminary assumption by comparing with other researchers opinions or clips of the same type, and will guess it is there for the purpose of illustrating amateur films, thus (s)he would choose that term ("amateur") as a keyword(p8).

Scholars are aware of the need for providing **high-quality annotations**. One participant mentioned that (s)he would not enter a tag if (s)he was not sure even if (s)he would get points for it(p6), and another participant regretted to have entered a tag without confirming before if the concept (s)he chose was correct(p9). It was observed during the test that scholars are very careful in their choice of keywords. Every choice resulted from their knowledge, from consultation and/or from reflection. In many cases, the participant did not think on the future retrieval purpose of a keyword, but on the "intrinsic" value to convey what (s)he interprets or considers valuable to highlight. Amusingly, one participant claimed not to trust keywords much since (s)he knows how they are made –(s)he has professional training as an information professional(p4).

For being an intense cognitive activity, and because familiarity with the source is so important, categorization usually requires **time**. One participant reflected on that (s)he would need days to watch and analyze one of the films in the session(p8). As it was discussed before (§6.5.1), awareness of time constraint may influence the type of annotation selected during a task. For example, for a scholar more time is required if precision is needed when creating keywords(p3), while, for another scholar, tags can be a choice for annotating if there is limited time(p9). The time issue was mostly mentioned in relation to the game activity (see also §5.5.6). In that context, it was also suggested that content annotation or description also requires intense **concentration**, mostly because film images are full of dimensions in each

[106] This concept comes from… (used in one study about tagging…)

second (camera movements, actors' expressions, framing, etc.), the expert not only has to perceive these but evaluate them(p7).

In relation to this concentration issue, **familiarity with creating keywords or tags** also plays a role, since a lack of acquaintance may make the task more difficult(p5): distinguishing the relevant aspects, thinking of the associated concept , and coming up with the best term for it so it becomes an interpretative clue for others is a complex cognitive task, that becomes more difficult if there is no previous experience in creating such annotations.

The previous common characteristics make the categorization/interpretation process a highly cognitively demanding activity(p7). However, it seems that the most difficult aspect of an annotation task in the investigated group was that of having to **think of other people**, users or purposes for which the annotations are created (§6.5.3.5).

6.5.3.4.Familiarity with source

Although seemingly an obvious remark, Study A showed evidence about how having seen a movie in advance, or having previous knowledge of it, certainly influences the annotation process (§5.5.5). In Study B, a few participants indicated that they were more inclined to select one or another annotation type (i.e., tags or reviews), depending on their previous knowledge of the film. In some cases, scholars chose to use tags or keywords for the less familiar films, and critical synopsis for more familiar sources. In relation to selecting the specific type of open text, one participant said that, not knowing the movie in advance would make her/him choose a descriptive text rather than a critical one, for not having the risk of making mistakes(p6) In addition, when the scholar did not know a film, (s)he spent some time in finding information and reading about it before starting writing the annotation. Hence, the level of familiarity may influence the time spent on the task and the type of annotation output.

Moreover, familiarity with the film can also determine which type of attributes the scholar decides to focus on. For instance, one participant explicitly stated that since (s)he did not know one of the fragments, (s)he decided to characterize what (s)he was seeing, using references to stylistic features from other movies of the same period, that she was familiar with(p5).

6.5.3.5.Annotation users and uses

The participants frequently think that people who go to websites looking for information about a certain movie have a preliminary interest in cinema. This was a common answer to the question on which person did they have in mind when creating the annotations for Sim1. Some participants considered that the readers of their annotations would be people with a certain level of cinephilia(p1). One expert also commented that "tags, more than a way to search, are a sign that something can be useful or not for her/his task at hand when (s)he searches, because the person who added a tag perhaps had the same "mental structure", and

considered a specific aspect important" to be made explicit(p4). This participant also added that, when annotating, (s)he was thinking of people like her, on how to "facilitate the work of people like her"(p4). As commented in one example above, by writing a keyword such as "no dialogs" one expert was sure that other experts would understand the challenge that this represented for the making of that film(p6). Another participant suggested that (s)he did not think on anyone who would read her/his annotations, but (s)he only thought of writing them correctly, in expressing her/himself as accurately as possible(p9).

Apparently, when the scholar has a "reader" for his/her text in mind, (s)he may be from the same domain and thus be able to understand their same codes. This is the opposite view to what literary scholar Gérard Genette observed in relation to the (book) epitext (which will be discussed in the next section). Epitexts are the texts produced outside the text itself as a way to advertise it or introduce it to the public, for instance in interviews to the author. Genette observes that in the case of the epitexts, "the addressee is never only the reader (of the text) but is some form of the public, including perhaps nonreaders of the text" (Genette, 1997, p.345). This means that epitexts address not a specific person or type of person, but the general public that is expected to welcome the released book (but it certainly applies to films and media). This could be an interesting issue to explore in future research, observing how the communicative intention of commercially or exhibition-oriented texts differs from the texts (annotations) created by scholars for other scholars, and whether they could also be interested in creating texts for other groups.

Indeed, as suggested above (§6.5.3.3), annotating for facilitating future retrieval to others is a process that requires a high cognitive effort. One participant suggested that it required "dividing oneself." For instance, for one participant it was especially difficult to understand why it was necessary to create new annotations for other people, since (s)he was convinced that once a person knows the title and/or director of a movie, (s)he will be able to find information about its content, either on search engines or on specialized sources(p7). In addition, there is evidence that knowledge of who the users or readers of the annotations will be may also influence the selection of a specific type of annotation. For instance, one participant explains that her/his preference for open descriptions or texts above closed thematic categories such as tags was due to the fact that the first are more suitable when it is difficult to predict the potential request(p3).

6.5.3.6.Attitudes towards annotation sharing

It is evident that annotation activities are essential to the work of film scholars. As described in §6.5.1.1, the shot-by-shot analysis is used in several cases for research purposes, while other film scholars are active in creating synopses as part of their curatorial work at film festivals, and others are active in extracting clips and classifying them for their classes and/or presentations(e.g.;p7). But, would the scholars be willing to share these annotations online or to other peers, or contribute with new ones using their expertise in creating them?

One of the questions of Questionnaire 2 (Appendix I, q.13) was about whether the scholar was willing to participate in *nichesourcing* activities (or *crowdsoucing* to be more general), especially if promoted by film archives. This questionnaire was applied both to participants in this study (Study B), as well to the fourteen participants of Study C. The consolidated frequencies of their answers are included in Table 6.11.

Table 6.11. Film and media scholars' level of willingness to participate in crowdsoucing initiatives

	N (scholars)	Yes	Yes, conditionally	Uncertain	No	(No answer)
Study B	10	2	7	0	1	0
Study C	14	1	6	3	2	2
Total	24	3	13	3	3	2

As it can be seen from Table 6.11, the majority of the participants who answer to the question (n=22) said "yes" or "yes with conditions" (n=16). The most important reasons for these choices are the following:

From the three scholars that replied with an unconditional "yes," only one wrote a detailed explanation of the reasons, which could be summarized on ethical concerns about film dissemination. Indeed, the scholar is worried about, and has interest and motivation to have an influence, on how films are disseminated online, both to make "popular" films "visible" to scholars, and films that are more known only in academic contexts closer to the general public. This scholar is convinced that such an initiative can be valuable for these purposes.

The majority of the scholars replied with a conditional "yes." They put forward the following reasons:

- **Organizational/project issues and professional authority**. This seems to be the main concern of the scholars. Their comments indicate that this is an essential task, but only if there is a structured framework to provide homogeneity to the contributions. The scholar would participate only in the framework of professional initiatives. Also, if the purpose is clear, the procedure is easy and efficient, and there is clear feedback, so the scholar knows if what (s)he does is useful. In addition, it should be linked to an academic network and the system should be easy to use. A scholar is hopeful that someone will start this!
- **Workload**. If the contributions are requested only in specific cases (not on a permanent basis). Not being forced and being able to say no at some moment when the scholar has limited time available. It should not be a lot of work!
- **Type of content (work related)**. Only for films that have an interest for her/his own topics, or that are pleasant to see. The type of films should correspond to her/his interests, and be online (which would be good news for her/him!)
- **Economic and formality issues**. Mostly if there is a specific type of reward (economic, or contractual)
- **Recognition**. If there is acknowledgment of her/his work (through giving credit)
- **Privacy**. The concern of having to enter personal data would be a barrier to participating

in open social web platforms such as YouTube, but this would not be the case if the initiative is proposed by an archive using a different system.

–**Cognitive/personal factors**. It is not his/her favorite activity; concern about the benefit for other researchers in using the annotations that (s)he creates for her/his research

–**Ethical issues**. The scholar would do it, but (s)he is skeptical of the need to put efforts in this "documentary" or retrieval tasks, since (s)he thinks that what films need is to be disseminated through education and correct exhibition or presentation, not being merely being retrieved or ordered. The scholar says: "access is not about indexing or ordering, but about selection and education$_{(p4z)}$.[107]

Noordegraaf et al., (2014) identified similar issues of the ones listed above in the case of *crowdsoucing* projects. The authors reviewed the literature to date looking for attributes of success or failure of *crowdsoucing* projects in the cultural heritage domain, identifying that the type of collection, the complexity of the task, the choice for a generic platform [i.e., information processing system in this thesis terms] vs. a dedicated project site, the level of specialized knowledge, and the lack of direction or feedback were critical factors. In this thesis study, several of the participant (domain experts) insist in that the complexity of the task and the lack of direction or feedback would influence their decision of participating or not in the *nichesourcing* initiative, and added other important factors; the most salient perhaps (distinctive to the *crowdsoucing* issues) is the level of interest in the source to be annotated.

Three scholars clearly replied "No" to such participation proposal. One of the most convinced participants within this group explained that (s)he was very much aware of the specific training that someone performing indexing or cataloging requires, and that most often the scholars do not have; besides, (s)he considers that working with information retrieval is a very demanding professional work, and as such, it should be paid$_{(p10z}$. Another scholar simply replied "no" because it was not simply her/his favorite task to do (indexing or cataloging), mainly because of the cognitive effort if there is a need for fast input. The third scholar who was negative about the initiative presented political arguments against free labor.

In addition, during the interview other potential barriers to scholars' participation emerged. For instance, one of the scholars was strongly critical about the commercial purpose that may be behind fine-grained annotations of films, which is an eventual use for image banks. In her/his view, this does not correspond to an aesthetic and scholar approach to cinema$_{(p2)}$. This participant is very critical about free contributions in online platforms, (s)he refers to it as "the economy of the gift", the fact that what used to be work is now given for free$_{(p2)}$.

[107] Original text in Spanish: "aunque creo que es un proyecto imposible creo que el acceso a las imágenes (películas) no pasa por los instrumentos documentales sino por la educación, la difusión y la exhibición de forma correcta. Es decir por la selección de qué ver y no por intentar ordenar o intentar acceder a la acumulación masiva... no sé si me explico." (b,p4). Translation (by this thesis' author): "Even though I think it would be an impossible project, I think that access to images (to the films) is no guaranteed by information processing mechanisms but by correct education, dissemination and exhibition. That is, it is more important to select what to see than to attempt to put order or provide access to massively accumulated [works]

Similarly, another scholar observed that certain "tags" or attributes are signs of reductionist views on the films and/or on simplistic perspectives towards them(p9), mainly when they are socially created, in sites such as IMDB. Similarly, there was concern about how a collectively annotated film would be useful for scholars since they may be annotated with different criteria by different users depending on a user's own questions in relation to the film, and combining all this may not be possible nor useful(SC,p12). Other problems were suggested, due to the differences in versions and lengths of the different copies(SC,p1) or the need for verification(SCp12;p14). These critical views may have to be considered by the institutions promoting the initiatives, in addition to the forms of collecting the shared annotations online.

For instance, the opinions about collecting those crowdsourced time-based annotations through games are not totally positive (according to the questions based on Part2 of the interview session (§6.4.3.2). For instance, talking about *"Waisda?"* one media scholar was critically pointing to the fact that the gamification approach, in this case, may not be appropriate since a scholar may visit the archive's website to see what is there, and not to play a game. Contributing with tagging would be a possibility, but not necessarily based on awards through points(SC,p7). As it was found in Study A, it is not common that scholars find motivation in this rewarding mechanism, although this does not imply that they necessarily have a negative attitude to games. Actually, most scholars in Study B who played the *"Waisda?"* game were amused and motivated and were very curious about knowing the scores of their pair colleagues. A media scholar states that "we don't have the conceptual tools to understand them [games] in terms of curation"(SC,p2).

In general, there did not seem to be an active participatory culture of sharing information on generic social online networks among the participants of Study B, even though most of them used services such as YouTube(rw) or Vimeo(rw) to watch films, but not for uploading videos. Although the study did not show a generally positive attitude towards the usefulness of shared annotations (e.g., IMDB plot keywords) in their academic activities, there was a generally positive attitude to online forms of participation. This may be a positive indicator that, when promoted by a film archive, online *participation* may be well received by their expert communities.

Finally, it is obvious that scholars would be also concerned about ethical issues in the context of a *nichesourcing* initiative, the most relevant ones are the need to explain the purpose of the initiative and the use that will be given to the scholar's contributions (e.g., if their annotations are going to be used for a commercial purpose, this should not be hidden). It is also important the need to inform that these initiatives are in principle not intended to replacing experts, but to supporting them. Likewise, annotations should not be collected without the person's explicit consent and with attention to respect for privacy.

6.6. Further discussion

This section presents a more open discussion about the findings described in the previous

section, as well as in comparison to the findings from Study A.

As it can be seen in Figure 6.11, there seemed to be a tendency to add more domain-specific terms (*cinematographic* attributes) in Study B than in Study A. In Study A, most tags resulted in *factual* terms that made the domain experts' tags similar to those of novices. This can be probably due to the need of adding time-based tags in the context of a competitive game based on matching. Another reason may be the fact that, in that setting, there was no option to replay or pause the clips, which is a need confirmed by domain experts in Study B. Nevertheless, other studies have shown that this type of "ofness" keywords are commonly assigned when annotations are done at the shot level, independently of the setting used for the annotating task (§5.5.2). In those cases, annotators tended to write common words for objects, events, or actions that belong to the pre-iconographic and "ofness" level identified by Panofsky and Layne (§2.8.3), and this happens mostly when the annotating task does not specify which type of semantic levels should be added. In spite of this tendency, there were also expert *cinematographic* tags that appeared in a less frequent, but more varied way in Study A (Table 5.4). Also, in Study B, since the experts were less constrained in the task, not only the *cinematographic* attributes appeared to be more frequent than in Study A for the compared film clip, but also the *factual* aspects tended to be focused on specific types of elements depicted in the images, such as characters and settings. Although the comparison between the studies was done only for one video, one could hypothesize that in the second case (Study B), *factual* elements were added based on "prominent depiction" rather than on exhaustive object identification[108]. These variations indicate that the type of annotation influences the type and density of semantic attributes, and that domain specific terms may be more frequent when the annotation task is not necessarily tight to a specific annotation style. Indeed, during a study about *crowdsoucing* initiatives, Noordegraaf et al. (2014) compared the types of words that were used in two annotation types that were enabled (tags and stories), and found that there was little overlap between the words entered in the stories and the tags linked to the same objects (photographs in this case). The authors suggest that "tagging and storytelling are complementary tasks that provide different types of knowledge" (2014, p. 31). Also, other forms of interactions are suggested in that study as a factor of *crowdsoucing* success, for instance through promoting a project forum (Romeo and Blaser, 2011, as cited in Noordegraaf et al., 2014). Even though the findings above are novel in the study of user-generated annotations (which to date have been mostly enabled in social sharing platforms through tags), they are not surprising from a cognitive perspective. The polyrepresentation principle (§3.3.3) already indicates that there is a variety of representations created with different cognitive and functional origins of the same objects.

Research about polyrepresentation has mostly focused on applying the principle by

[108] The concept of "prominent depiction" in visual image indexing, also called "pertinence" (Yee, 2007, p. 151), indicates that only what is "clearly represented and identifiable" should be described (p.150). Yee also adds that indexing based on prominent depiction is recommended "unless the object or other item given a heading is rare or unusual or historically significant." She calls this concept, the "criterium of novelty."

combining representations that previously existed in the information space, testing new logics and algorithms in relation to cognitive overlaps originating from embedded or explicit representations. A less investigated area is the way in which those representations are created (i.e., the information-annotating behavior of the annotators, as it was discussed in Section 3.3). Because the polyrepresentation principle is media dependent[109], and because of this thesis is focused on moving image representations, the remainder of this section focuses on the implications of the observations above in the case of moving image annotation and retrieval. This starts with the examination of the following quote in relation to the polyrepresentation principle:

> "The different media are characterized by different sets of cognitive actors and functional representations, as well as different presentation styles that depend on the actual domain, genre and document type" (Ingwersen, 2012b, p. 42).

The argument in the previous quote indicates that different media are characterized by different sets of "functional representations" and "presentation styles." These two concepts are essential for the problem researched in this thesis, and thus, they will be explored more in detail, attempting to refine the concept of "annotation style" and "annotation type" that have been used rather interchangeably in the thesis until this point.

The original concept of "**functional representation**" indicates that besides variations in cognitive origins (i.e., due to the representations originating from "different sets of cognitive actors"), the same actor (same cognitive origin) can produce different representations of the same information object. In the case of scientific documents, these functionally different representations could be, for instance, author-generated text structures, image features, diagram captions, and references or out-links (anchors) (B. Larsen et al., 2006, p. 88); or title vs. abstract vs. full text words in an academic publication by the same author(s) (Ingwersen, 2012b, p. 42). The findings in this chapter provided insights into the different types of functional representations (§6.5.1) created by the same actor during different tasks. For instance, one participant may have created a review in the first task and a series of tags/keywords during the second task.

The term "**presentation style**" is not explicitly defined by the authors of the polyrepresentation theory, but the following examples show the scope of its use in some of their texts (underlining is added):

> "On the other hand, one may note that the writing (or message) style apparent in the various forms of entities influences the retrieval parameters. Paragraphs from introductions are functionally different in style from the corresponding abstracts, and both styles are rather different from that applied to paragraphs embedded in the main body of the text" (Ingwersen, 1996, p.30).
>
> "Every document type has its own style which may vary from domain to domain. Sociologists write differently from physicists, who again convey their academic

[109] "It is thus possible to construct a range of polyrepresentative models for each distinct media type and genre" (The Turn, p.342; also Ingwersen, 2012, p.63).

> messages in styles that are very different from those of journalists. Also citation styles vary from field to field. The style in spoken messages differs from that in written communication." (Ingwersen, 1996, p.30).
>
> "Paragraphs from introductions are functionally different in style from the corresponding abstracts, and both styles are rather different from that applied to paragraphs embedded in the main body of the text" (Ingwersen, 1996, p.30).
>
> "In addition, document representations are made from different presentation styles according to the conventions of discourse in domains and media" (Ingwersen & Järvelin, 2005, p.208; Larsen et al., 2006, p.88).
>
> "The different media are characterized by different sets of cognitive actors and functional representations, as well as different presentation styles that depend on the actual domain, genre and document type. Articles in the humanities are written in a different style from scientific papers, which again are different from news items in magazines or radio/TV broadcasts, etc." (Ingwersen, 2012, p.42).

The previous quotes show that rhetorical terms are very common indeed in the polyrepresentation literature. In the study presented in this chapter, a useful way of differentiating the annotation outputs created by the scholars was to look at their "discourse mode" (i.e., descriptive, narrative, argumentative, instructive) (§§6.4.4.2; 6.5.1.2). This concept, used in the study of language and communication, pays attention to the social functions and intentionalities conveyed by authors (and people in general) in their messages, and may be similar to (or part of) the concept of "presentation style" proposed in the polyrepresentation theory. In addition to this concept, there are other categories involved in determining the nature of polyrepresentation(s). The following quotes illustrate both the rhetorical connection and suggest additional elements:

> "Many representations with strong functional characteristics are available because of the rhetorical structure of the academic documents, commonly organized in specific ways according to convention, e.g., introduction, theory, or methodological sections, results, discussion, and/or conclusions. Like presentation style, the *structural organization* is domain and media-dependent and very useful as a *supplement* to subject matter. Aside from the structure of the documents, the section titles at different levels and the table and figure captions are examples of functionally different ways of representing a document" (B. Larsen & Ingwersen, 2005, p. 48, italics in original, underlying added).
>
> "In summary, documents have three dimensions: content, explicit structure, and layout (e.g., text styles, number of columns). Essentially, these are dependent on domain, media, and social discourse community" (Ingwersen & Järvelin, 2005, p.126).

The first quote above introduces more explicitly another element that seems to influence (or be part of) the concept of "functional representation", which is that of "structural organization." The second quote above indicates three other elements of documents in general: content, explicit structure, and layout. These are commented next.

Until this point, it could be possible to conclude that the concept of "functional representation" involves two elements: "structural organization", and "presentation style," both associated with writing conventions that originate in each discipline or domain. It is

suggested from this point that "structural organization" (*dispositio*) is used to refer to the inherent structure ("explicit structure" in the quote above, although it may not necessarily be the case). Also, that "presentation style" is used to indicate the communicative intention and design (*elocutio*) of the message or "content", which include discourse mode and "layout". The concept of "structural organization" may be more associated with rules or explicit conventions, while "presentation style" may have a higher personal component; indeed, the term "style" as used in the cognitive IR literature (e.g., "searching styles," "cognitive styles") connotes a more behavioral aspect related to the individuals.

Because the purpose is to apply these concepts to the study of moving image annotation, there is, at this point, the need to clarify the differences between the concepts of "polyrepresentation" and "annotation," connecting the ideas previously proposed in this thesis to the newly identified ones. "Polyrepresentation" is an IIR principle. It assumes that different representations exist in documents. As a noun, the term "polyrepresentation(s)" would indicate that those representations are multiple, and could be used during retrieval. Hence, "annotation(s)" in the scope proposed in this thesis (§3.4.1; 3.5.1) is a narrower concept of polyrepresentation(s). That is, an annotation (as in the term "annotation output") would be one type of information object that has a clearer representational function in relation to a specific information object; it could be closely linked to the object itself –for example, a time-code, or an underlying mark-, or exist independently of the annotated object –for example, a review). Some representations exist as information objects only because of their representational purpose (e.g., a descriptor), while others are more representational but may have been created for other purposes as well (e.g., a distribution synopsis which intends to represent a movie, but also to attract viewers to see a movie). Other representations that are not annotations in this sense exist in the information space, embedded in the objects, but they may not have been created with a representational intentionality. An important aspect that needs to be reminded at this point is that the creator of an information object may not have the intention of producing the necessary structures in her/his creation to enable future retrieval (this concept was named "IR stewardship" in Section 3.5.1). For instance, an author writing her/his dissertation may decide to provide an index or a very detailed table of contents instead in order to guide the readers, but the most common case (to date) is that the creator does not think on how to provide the structures for her/his work to be retrieved in the future by IR engines.

Processing and retrieval mechanisms based on the structural organization of documents, when it is made explicit or not, have been already studied in IR (e.g., Kwok & Kuan, 1988) (see also Appendix L). In addition, from other disciplines, these structures or rhetorical forms are analyzed as part of the broader context of communication (e.g., political discourse), "research cultures" (e.g., Tuominen et al., 2002), or in literary and humanistic cultures. In the latter case, the work by literary critic Gérard Génette is prominent. His work on poetics, which is to "literature what linguistics is to language" (Kritzman, Reilly, & DeBevoise, 2007, p. 535),

reflects his structuralistic view on texts, which could be naturally associated with the concept of "functional representation" proposed by the polyrepresentation principle[110]. This connection is necessary at least in the domain of imaginative works, which fiction films and other moving images can be considered part of.

In the realm of books, Genette's concept of "**peritext**" discloses the nature and role of "structural organization" elements, showing how format, title page, typesetting, dedications, inscriptions, epigraphs, prefaces, or notes are part of the text's "liminal devices and conventions," in this case related to all productions inside the main text. Using his concept, one could interpret that some "peritexts" have an intentional representational nature (e.g., indexes, tables of contents), but also others do not have that intention but still facilitate their representation and retrieval, for example, the "outlinks or references" to other works presented in the reference list. Genette also considers the "origin" of these productions, differentiating the publishers' peritext from the other inner elements created by the authors themselves, which provides clues to understanding the different cognitive origins of the different representations. Likewise, Genette's concept of "**epitext**," which encompasses all productions outside the main text, either private (authorial) or public (from the author or publisher) (Genette, 1997) may be considered to have a higher representational nature, since they refer to the work from outside with different purposes (e.g., the distribution synopsis mentioned above).

In sum, one could say that, from the polyrepresentation perspective, the annotation outputs created by the scholars are (poly)representation(s) with their own characteristic structural organizations and presentation styles. For example, a review is structured according to certain conventions and is presented with different communicative intentions or discourse modes. In this perspective, (media) representations created by domain scholars can also be considered document types on their own behalf. That is, a review exists as a representation of a media work, but also as an independent critical text (an epitext, in Genette's terms). Likewise, several information objects, such as other media works, or works in other media, may have hypertextual relations to a given object[111].

[110] A brief description of the concept of "transtextuality" in Genette, and its use in this realm is included in Appendix L.

[111] There are of course different perspectives about what the main text could be: for instance, researchers in the area of graphic design, may focus on the poster as "the text", and thus the film that it advertises would be considered the paratext. This also connects to the discussions on "intermediality" that are introduced in Chapter 7 (§7.6.2.1). In the current vision, the different perspectives about what the main "text" is are competing: for instance, the poster collection in an archive describes them thinking on concepts of graphic design, since they see the poster as the "text," creating separated databases to these needs. The term "film-related materials"* used among the film archival community, or "documentation"* by audiovisual archives, indicates that the center is the moving image. The concept of "intermediality" (§7.6.2.1) and "intertextuality" (§6.3.1), find a positive technology support in the context of Semantic Web technologies, through which connecting, and changing the focus to a given "text", are technically possible. Gray (2010) explains: "As I have been arguing throughout this book, a proper study of paratexts and an attention to off-screen studies challenge the logic of "primary" and "secondary" texts, originals and "spinoffs," shows and "peripherals" often used to discuss paratexts. That logic traditionally regards the film or television program as the center of the textual interaction and the only source of authentic textuality, while peripherals are relegated to the role of nuisances cluttering streets, screen time, cyberspace, and shopping malls, and are seen as tacked on to the film or program in a cynical attempt to squeeze yet more money out of a successful product. What I hope to have posed is that the

In addition, in the context of annotating-related activities, these inherent structural and presentational characteristics of the annotations are influenced by the work tasks in the cognitive actor's space where information object creation occurs. Using Ruvane's (2006) concepts (Figure 3.7), it could be possible to observe some characteristics of the work tasks that are more influential in the creation of annotations (or representations) of information objects. For instance, an annotation may be different if the information object (or the stand-alone annotation) is done for private use or for public use, or if it is done during reading or during writing; or if it is intended to be explicit, or just happened and was embedded in the object (tacit). One of these dimensions is the aforementioned IR stewardship level.

The immediate benefit of linking Genette's transtextual theory to polyrepresentation theory is that the findings from literary and media studies research can be applied to a better understanding of the information space. Indeed, the aura-like "annotations continuum" proposed in Section 3.5.1, could now be regarded as an "annotation/derivatives continuum," (or as a "document/annotation/derivatives continuum," including the transtextual connections of the information objects to be more precise[112]). Figure 6.12 zooms in into this extended IS&R model, which includes this transtextual, annotations, dimension as part of the document space.

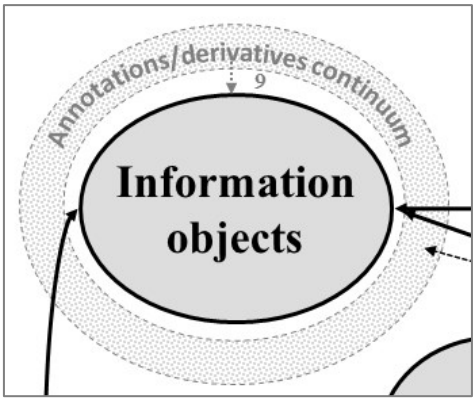


Figure 6.12. Zoom into the IS&R document/annotation/derivatives continuum

"peripherals" are often anything but peripheral. Instead, they often play a constitutive role in the production, development, and expansion of the text. Granted, the existence of the film or program usually remains a precondition for the paratext's existence, and thus the film or program remains important, but it does not do its work alone, nor will it necessarily be responsible for all of a text's popular meanings" (p.176).

[112] The term is proposed by adding the terms "annotation," and "derivatives". The latter one originates in the use that is done of that term in the FRBR model (Tillett, 2004, p. Figure "Familia de obras"), to indicate that a work experiments a series of transformations (e.g., new editions, abridged editions, translations) that originate what is called "derivative" in that model. It is also part of academic terms, see also "primary source*."

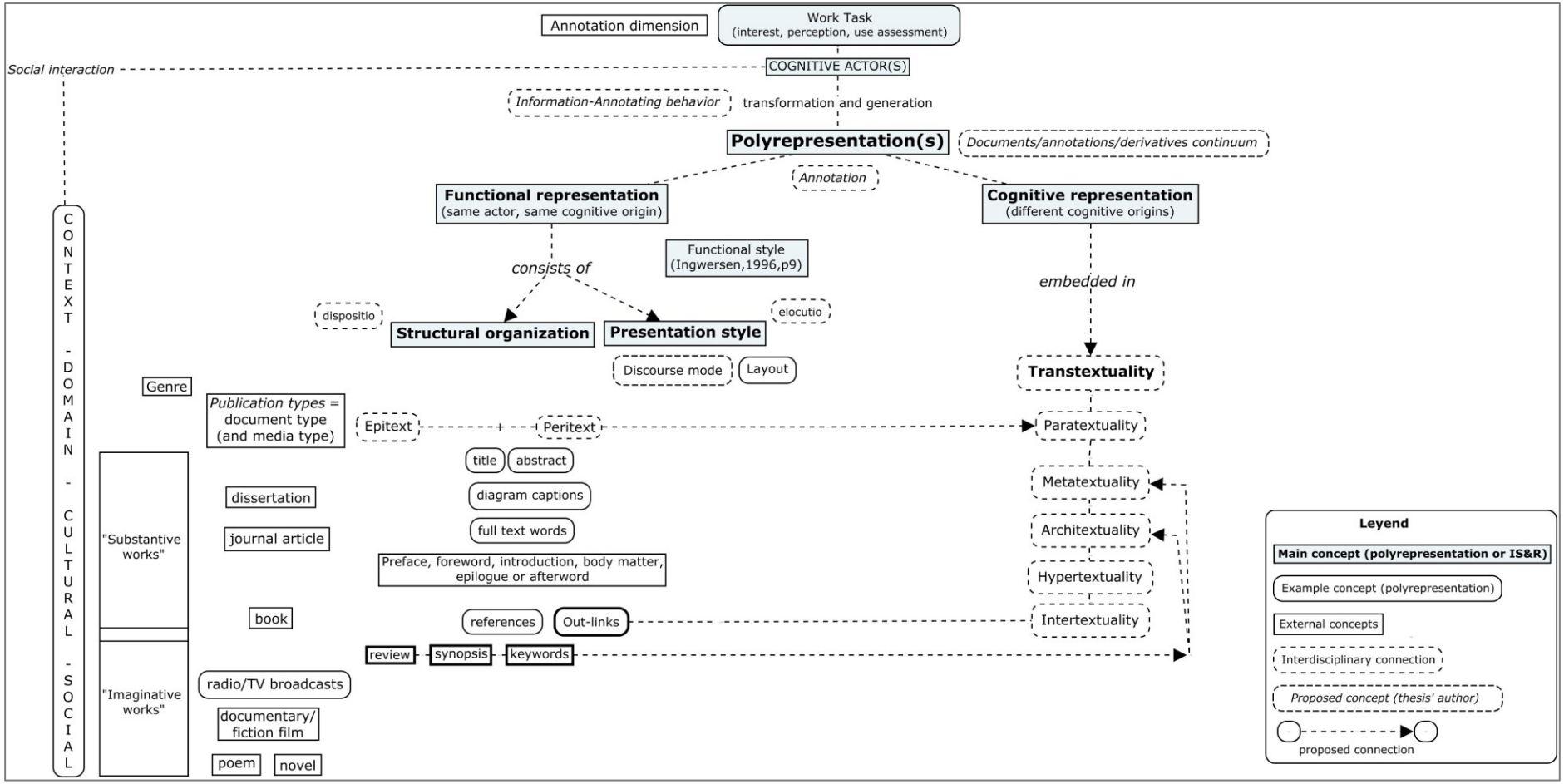


Figure 6.13. The document space of the IS&R framework (polyrepresentation, annotation, rhetorics and transtextuality)

The previous paragraphs, summarized in Figure 6.13, have attempted to define the concept of (poly)representation(s) in relation to the concept of annotation proposed in this thesis. Figure 6.13 illustrates the mentioned concepts and suggested interdisciplinary connections. In the remainder of this section, these concepts are applied to the moving image domain.

Even though Genette's concepts originate in the realm of books, they seem useful for understanding the nature of polyrepresentation(s) and annotation(s) in the media domain, where Genette's concepts have been used to a little extent (Appendix L). Such understanding could facilitate research about media retrieval and moving image annotation. The most common case to date of the first aspect consists in linking shooting scripts (an external peritext since it contains the explicit structural organization of the moving image) to the images (e.g., Turner & Colinet, 2005) (§2.7), which complements current efforts in automatic annotation attempting to find shot boundaries automatically (§2.4). Also, there is already one study reporting the application of the polyrepresentation principle to the indexing of multimedia sources, presented by Zellhöfer and Schmitt (2010).

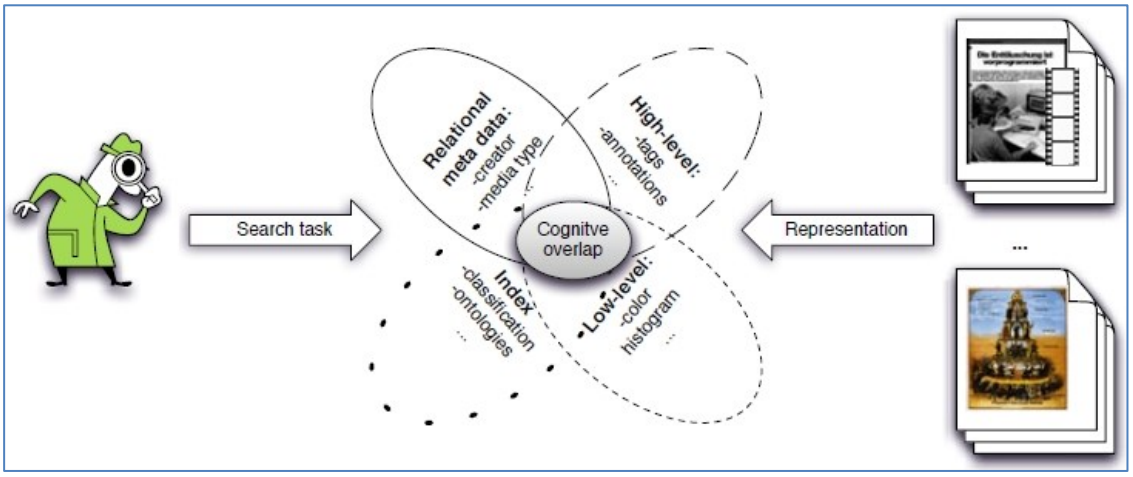


Figure 6.14. Polyrepresentative perspective of multimedia retrieval. (Zellhöfer & Schmitt, 2010, p. 48)

"Venn diagram of different document representations forming a cognitive overlap."

Figure 6.14 presents the polyrepresentational view of multimedia annotations proposed by Zellhöfer and Schmitt, in which the circle of "high-level" annotations (including tags and other annotations) represents the users (information seekers) as actor. In addition, following the transtextual connections, it could be possible to identify other representations that could be tested in the cognitive overlap.

These moving image external connections to other texts could be enlightened by Genette's concepts, and mainly through the studies that have applied his ideas to the realm of film (e.g., Gray, 2010). For example, the "documents/annotations/derivatives" continuum, in the case of films and other media, would appear as shown in Figure 6.15. An additional example that illustrates the media dependence of the polyrepresentational principle is shown in Figure 6.16, which depicts the most important aspects of the aforementioned concepts to the realm of (imaginative) books.

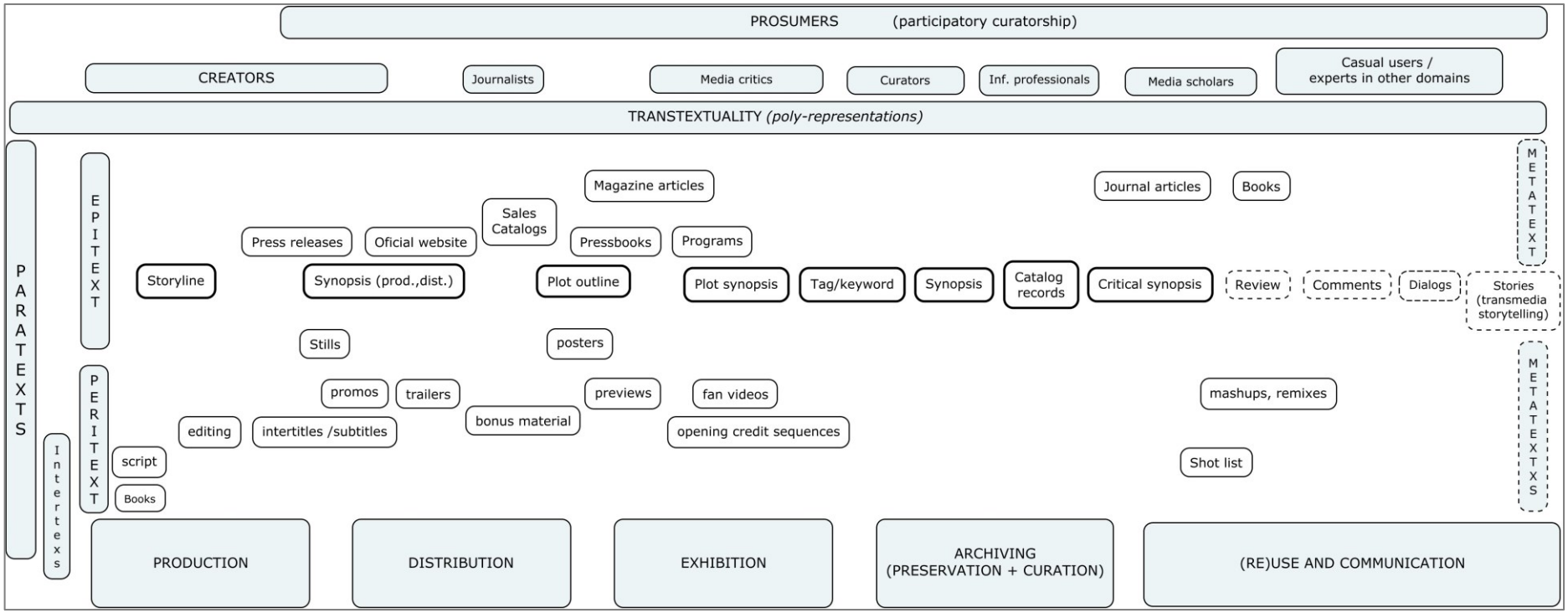


Figure 6.15. The film/media's polyrepresentational continuum (with some examples).

(Self-authored, based on concepts by Burt, 2007; Fossati, 2009; Genette, 1992, 1997a, 1997b; Gray, 2010; Stanitzek, 2005; Toffler, 1980; and on Study A+B's findings)[113]

[113] I thank Prof. Frank Kessler for his comments and valuable clarifications to the first version of the graphic.

Author him/herself.....Author (self or different).....Author / Reader/ User.....Information professional (Indexer).....Reader/User											
Creators ..... Contributors ..... Lurkers											
TRANSTEXTUALITY (*poly-representations*)											
Paratexts.....Metatexts.....Metadata.....Scholarly/personal annotations											
Epitexts .....Peritexts.....Critical works.....Derivative critical (new) works.....NLR.....Hermeneutic markup.....Categorization.....glossing, marginalia											
Script (adaptation)	Citations / References	Preface, foreword, introduction, epilogue or afterword	Reviews	Annotated editions	Critical editions	Abstracts	Linguistic analysis POS tagging	Subject headings, Descriptors	Tags, comments, keywords	Organization (bookmarking)	Highlights, underlines…

Figure 6.16. Information objects and annotations continuum

(Self-authored, based on concepts by Genette 1992; Pellat, 2013; Ruvane, 2006, among others -§3.4.1)

Figure 6.15 shows how a great variety of sources* (texts in the most general sense of the term), are created during the media production, distribution, and exhibition chain by different actors. They range from "industry-created paratexts" to "audience created paratexts", using the terms by Gray (2010, p.143). This upper part of the graphic, above the "transtextuality" segment, indicates cognitive representation, that is, the variety of actors that intervene in the creation process of texts (documents) and their annotations and derivatives in the media domain. The circles in bold indicate the kinds of texts found in this study. Only "stories" and "comments" were absent from the scholars' annotation outputs, but they could be regarded, as well as the others in this line, as potential forms of interactions to be expected from people participating in *crowdsoucing* (or eventual *nichesourcing*) projects. Indeed, there is a recent interest in the area of "audiovisual storytelling", which encourages casual users to contribute not only textual stories, but also to create their own audiovisual stories, by using videos from audiovisual heritage collections (Oomen, Verbruggen, Tzouvaras, & Hyyppa, 2013). Likewise, in a broader view of annotation as forms of interaction, also "commenting", "questioning" or "moderating" discussions about media works can be regarded as annotational or representational acts. For example the initiative by the Swedish film institute "Watch and discuss film"$^{(rw)}$, where users are invited to engage in those dialogs in physical spaces, could easily be incorporated into communicationally oriented archival systems online, facilitating a non-explicitly representational dialog, which could still serve accessing and retrieving moving images purposes.

Following the polyrepresentation principle, not only traditional forms of metadata should be sought as part of the "users" contributions. Formal metadata (e.g., subject headings, keywords) is the aim that, to date, most *crowdsoucing* projects have aimed for[114]. However, from this study's results, it could be equally assumed that all textual productions in the "document/annotations derivative continuum" have a potential of becoming "metadata," since they are indeed connected by definition to the main text (the media work in this case). In this case, in principle, obtaining multiple representations of media works through UGC would not a problem, but an advantage for moving image retrieval. This is so, "because the boomerang effect needs different cognitive and functional representations in order to function" (B. Larsen, 2004, p. 6). Furthermore, as it is explained in "The Turn," "depending on the available IT the author may be able to *point* to useful sources by means of, for instance, scholarly references, acknowledgments, or navigational Web outlinks" (p.266). Hence, in a *nichesourcing* setting, from a behavioral and cognitive perspective, it is important to facilitate the best annotating options for the experts to express their domain knowledge. Proposing

[114] Indeed, the most common way of thinking on solutions within the LIS and IR field is through the creation of access mechanisms based on control. This is also the attitude assumed in relation to emergent forms of user contribution, such as tags, as it is evidenced by the great number of research about how to leverage tags to subject headings, or on how to obtain better quality tags from non-trained contributors, or in trying to train them to think in terms of potential retrieval (Fleischer & Backe, 2011). However, current advancements in natural language processing and computational linguistics, could be used in order to allow more flexible contributions from the spontaneous contributors who may prefer to contribute to a *nichesourcing* initiative through other forms of annotations.

this connection is in line with the presented view of annotation in this thesis, as a flexible way of representing information objects, talk about them, and create new objects based on them. In this way, "natural language representations" (NLR) (Ingwersen's, 1996) find their way into the possibilities for annotating moving images in a *nichesourcing* context.

Indeed, in the case of the annotation types in the bold boxes in Figure 6.15 which are less formal types of annotations (that in this study were called "open texts"), there is evidence that indicates that they follow structures that could be processed through computational linguistic methods. Certainly, the polyrepresentation principle is closely tight to the idea of "segment retrieval," or "passage retrieval," and "nanopublications." The concept of "semantic entities" or passages proposed in Ingwersen (1996) gives a foundation for proposing the idea of linking functional textual structures to their correspondent media at different granularity levels. Here the concepts by film theoretician David Bordwell could provide insights from the discipline of film studies. Bordwell developed the idea of "text schemata" (§6.5.2.1), and "semantic fields", which indicate the presence of patterns in the texts, that reflect semantic aspects from the films. Hence, if functional representations created by domain experts could be linked, for instance, to specific scenes, the structural organization of the annotations would indicate where the descriptions about prominent depictions are. Passage retrieval could also be enhanced via detection of presentation styles (modes of discourse), thus enabling retrieval of critical comments or more informative descriptions for a given fragment. This view could enable the extension and application of previous work in the domain of indexing fiction (e.g., by Pejtersen and Lancaster), who already show how abstracting and indexing have other characteristics than in the case of scientific works.

Besides, in addition to the potential advantages for moving image retrieval, this "transtextual" perspective could facilitate a better understanding of the role and nature of the annotation outputs created by the scholars. In that view, they could be regarded as "metatexts" in the broadest sense (since they establish a "commentary" relationship with the text, of an intellectual and descriptive order (Genette, 1997a, p. 12), and also "architexts" (since they make more explicit the taxonomic categories such as genre); and mostly as epitexts, since they are produced outside the main text (the media work) as a way to contribute also to their reception and circulation in society, and also to a (poly)representational construction of meaning[115]. Indeed, one of the participants clearly stated that the first responsibility of someone who knows about cinema and expressive cinematographic resources is to point to the valuable elements when they exist[116]. On the

[115] The problem of meaning in information science is analyzed by among others Ingwersen (1992, p.24) and Ingwersen and Järvelin (2005). For example, in the "Mark Twain Painting Case", referred to in the previous sources, a painting hanging on a wall could potentially have several textual labels representing what the painting itself represents. According to the authors, this shows that, especially in non-textual media, the information potential is multiple, and information may be equal to meaning, or on the contrary be detached from it. Since detaching meaning is an essential impossibility given the nature of film (and other art and forms of human expression), the meaning provided by an actor is but one of the several possible interpretations.This issue will be discussed in Chapter 7.

[116] Original quote: "considero que la primera tarea de quién sabe de cine y de recursos expresivos del cine es indicar los

contrary, other annotations (e.g., synopses, but not critical synopses), play a clearer "metatextual" role, in the sense that they have a defined intention of "representing" the content of the moving image (as it can be seen from the predominant narrative and descriptive sentences in Table 6.5), that is, of acting as surrogates. This metatextual level is characteristic of formal annotations (§6.5.1.3).

The connection of the polyrepresentation principle to other disciplines is important, since the principle is media dependent, thus requiring conceptualizations from each discipline or domain in order to understand textual structures and the domain-dependent varieties of the different media (poly)-representations. In the domain of scientific communication and IR, Ingwersen (2012a) has shown that bibliographic references, as well as citations to documents, can be seen as "footprints of information interaction, because of the behavioral conventions built in to the scientific communication and publication process." In this discussion section, it has been argued that those conventions, in the realm of imaginative works (as defined by Lancaster, 2003, and other researchers in the fiction retrieval domain), have also been theorized by formal and rhetorical studies in poetics and narratology originating in literary studies; which in the case of film theory could be fruitfully applied. The rich variety of peritexts, epitexts, or metatexts shown in Figure 6.15, indicates that the principle of polyrepresentation for media items is not only possible but necessary, since media do not exist independently, but accompanied by a great variety of other productions (textual, but also audiovisual) that have a "representational" or "transtextual" connection to the central object under consideration.

6.7. Conclusions and future work

The study presented in this chapter was guided by the following general research question:

RQ2. *What characterizes film and media scholars' **information-annotating behavior** in relation to moving images? How would scholars perform information-annotating tasks intended to serve future retrieval purposes, and which are their attitudes towards these shared annotations?*

The broad conclusions and implications related to this question are presented in Chapter 8 (§8.2) while the findings for each specific research question are summarized next. It is important to remember that these conclusions apply mostly to the studied case, even though they may also have broader implications and transferability to the media domain:

RQ2.1. *What types of annotations are used by film scholars when assigned a moving image-annotating task for the purpose of future retrieval?*

Conc. B.1. Film scholars use a wide variety of annotation types, ranging from formal (or IR-oriented) ways of annotating (e.g., tags/keywords) to open textual descriptions (e.g.,

rasgos estilísticos más importantes" Participant [7].

reviews). These annotations are produced as a result of annotating (describing) tasks for moving image content for the purpose of future retrieval. They can be considered forms of (poly)representation, functionally or cognitively different, and characterized by different structural organizations and presentation styles. Participants in the study mostly preferred to use open textual forms, followed by formal annotations, and a combination of both.

Conc. B.2. The selection of a specific type of annotation depends on several factors. One of them is the level of familiarity with the source to be annotated (e.g., open texts for familiar sources and formal annotations for less known sources). Another factor is the level of constraint or guidance provided in the task's instructions (whether or not a specific type of annotation is suggested or required). A third factor is the knowledge of the context in which the annotation output will be used (the "social utility"). The type of source to be annotated, even if not evaluated in this test, is indicated by the participants as an additional influential factor (i.e., each movie and its content demands a different type of description, simpler or complex depending on the variety of factors that make the film unique or not). This factor could be related to two concepts in literary studies proposed by Roland Barthes, namely "readerly texts," "writable" texts (i.e., those texts that give room for interpretation and discourse).

Conc. B.3. Scholars also pay attention to the level of "expressiveness" that a type of annotation may have or not when they have an idea to communicate (e.g., preferring open texts to express opinion or value judgment, rather than a formal keyword). These communicative intentionality aspects can be analyzed through discourse analysis. Other discoursive features are observed in the scholars' annotations, for instance, the predominance of informative discoursive elements over argumentative discourse elements, and the consideration that the public that may read their descriptions will be part of the same scholarly community. Even though there are contradictory ideas on whether personal opinions or argumentative discourse should be used in annotations that are supposed to facilitate retrieval for scholarly purposes, there is an overall tendency to select "reviews" and "critical synopses" among the open annotation forms. These types of annotations include more argumentative elements than the other open forms. These discoursive features can be regarded as the "stylistic", "presentational" side of a functional or cognitive representation.

Conc. B.4. There is no established terminology to name film/media-related textual annotations such as those found in this study, or the several types that abound on social media sites that include films. The three types proposed by the FIAF cataloging Rules (A textual analysis of the participants' annotations, combined with the basic theory of film criticism indicated that different criteria could be used for their characterization. Those criteria are the level of formality, the number of sentences, the attention to plot elements, the presence of argumentative discourse, or the inclusion of background or contextual information. The resulting types are formal annotations (tags/keywords, keyphrases, shot lists); open or natural language annotations (reviews, synopses and critical synopses, plot synopses, plot outlines, and storylines); and a combination of both formal and open

annotations.

Conc. B.5. The information space in an IS&R framework may be characterized as a transtextual continuum of information objects, annotations, and derivative objects, all of them embedding or making explicit poly-representations of the objects they are attached to. All objects in this continuum are part of broader contexts of communication, learning, understanding and interpretation. The principle of polyrepresentation may be applied to this continuum. This agrees with previous research on the application of social tagging in the cultural heritage sector which has indicated that professionally assigned metadata can be complemented with user-generated metadata (§5.3.2). In the moving image domain, other researchers confirm the idea that the best information systems for storing and retrieving moving images incorporate different approaches, also including automatically-generated metadata (e.g., Turner et al., 2002).

RQ2.2. *Which attributes of the moving images are more relevant for film scholars when performing a describing task?*

Conc. B.6. In terms of the broad types of attributes (i.e., *"facs", "emotions", "explanations", "other"*)[117], the participating scholars included mostly factual words or phrases in their annotations (similarly to the case in Study A). Cinematographic elements such as sound, music, montage, mise-en-scène, types of shots, color, light, framing, among other elements, and/or phrases to highlight the general cinematographic value of a given film, are frequent in both tasks in Study B, and had a tendency to be more frequent than in Study A. Also, although not statistically significant, there was a tendency to add more of these elements in the second task, in which a context of use was provided (academic), as opposed to the first task, in which no context was indicated. Future research would be needed to know whether these elements would be equally distributed in the case of other types of films or genres. Besides, a question that remains is what the use of terms, such as, e.g., "vampire", "old lady", or "human figure", would be in film and media research (this will be explored in Chapter 7).

Conc. B.7. The "Other" category follows after *"Cinematography,"* indeed, many words or phrases referred to background elements of the films, such as the name of the director, or the production year or country. A less obvious observation is that these "objective" elements (e.g., the year of production of a film) also serve the purpose to carry interpretative messages, since the scholar is aware that other pairs in her/his domain will know how films were made in that year, making them decide that it would be unnecessary to provide other details. The least used category was *"Emotions"*, also proportionally less than in Study A for the same analyzed clip, which provides evidence that experts or scholars in the film domain are not keen on using emotional aspects to annotate the films.

Conc. B.8. In relation to the specific types of attributes (e.g., characters' traits or actions, shot types, themes or topics), the variety is rich, although the most frequent elements are

[117] *Classification No.1*, §5.4.7 and Appendix B.

attributes of the film's characters' and cinematographic elements. This finding correlates to film critic David Bordwell's (1991) concepts of "text schemata" in film criticism, which explains how interpretive texts often follow common patterns that are also related to semantic fields in the films, indicating that textual structures in this realm are usually centered on characters and their actions, followed by descriptions of surrounding elements (i.e., "diegetic world"), and "non-diegetic representations" (e.g., camerawork, editing, music, etc.).

Conc. B.9. In the case of open textual annotations, the different types of attributes are often combined in the sentences that use normal structures of written language composition (for instance presenting factual elements, together with details of their style or composition, connected by other discoursive elements, such as "it inherits the techniques of…", "it exemplifies…"). In other cases, the texts are organized in paragraphs where the density of a given attribute is clearly higher per paragraph; and, in a few cases, the scholar himself provides an explicit structure separating the types of attributes being described. This finding, together with the analysis of the differences in semantic attributes used between Study A and B indicate that the types of attributes and their frequency may vary depending on the type of annotation form adopted.

Conc. B.10. There is not a homogeneous opinion about which aspects are more important in a content description that is supposed to be used by domain experts, it seems that a balance between plot (narrative) elements and cinematographic elements would be ideal, and the weight given to each of them would depend on the task and potential reader (i.e., novice or expert).

Conc. B.11. Findings of the scholars' annotating behavior indicate that in information-annotating tasks for the purpose of retrieval, guidelines are expected about what type of elements should be included and, if this is not given, the scholar may try to provide her/his own structure.

RQ2.3. *What are the attitudes and perceptions of scholars towards their information-annotating behavior, and towards shared annotations?*

Conc. B.12. Most participants needed to know in detail what the purpose of an annotating task is, how it should be performed and, in some cases, how their annotations would be used. The natural way for scholars to annotate their sources is based on research questions that guide them in the analysis, that is, they annotate with scholarly purposes.

Conc. B.13. One of the most cognitively demanding aspects of the annotation tasks for the scholars was to think of the users or readers of their annotations. Most scholars performed their annotating tasks thinking on the intrinsic qualities and value of their texts, not necessarily guided by who the potential readers would be, in those cases. Conversely, the experts commented that their responsibility as experts was to contribute the best of their knowledge in making clear for the potential audience which was the value of the specific movie or clip. Even though several participants in this study were familiar with the basic principles of indexing or information retrieval mechanisms and thus, were familiar with

creating annotations that could facilitate that purpose, for others it was difficult to think about how to do the annotation task for that purpose or to know which aspects they should include. One scholar considered this activity as "dividing him/herself", and another scholar indicated that this type of cognitive effort (for documentary purposes" as (s)he called it) requires professional training.

Conc. B.14. Many information searching activities take place during the information-annotating tasks, scholars need to find complementary information, cross-check, and validate their opinions by reading what other scholars in the field have said before. Most importantly, the scholar may try to find key details of a source that is not known to her/him, in order to get familiar with a film in order to perform a "good quality" annotation task. There is evidence to think that their understanding of what "quality" means, in this case, is accuracy.

Conc. B.15. Most scholars are willing to participate in *nichesourcing* initiatives, although most of them are also critical of potential misuse or exploitation labor factors behind them. This criticism may be less in the case that the activity is promoted by a respected institution, for instance by a film archive.

CHAPTER 7. Study C: Film and Media Scholars' Information Needs, Seeking and Search Behavior: A Case Study with Emphasis on Annotations that Support Research

"Artists and art historians may not like research to be easy, and may, in fact, benefit from imprecise retrieval methods: one person's irrelevant image may be another's serendipitous discovery" (Layne, 1986, p. 34).

7.1. Chapter Overview

Chapters 5 and 6 focused on the film scholars' tagging and information-annotating behavior. This chapter centers on the broader aspects of film scholars' information needs and seeking behavior. These aspects provide the context for observing the types of annotations that support moving image-seeking processes during research and teaching-related tasks. The chapter reports on Study C, conducted between February and May 2014.

It includes an introduction (§7.2), which presents this study's research questions. Next (§7.3), there is a description of the main concepts from the IB discipline used in this investigation: information needs, and seeking and search behavior. After that, the chapter includes a literature review of the information needs and seeking behavior of specific groups of scholars (§7.4). This review is comprehensive, and includes: first, the studies about how the humanities scholars seek and use audiovisual media. Second, IB research focused on small groups by discipline, including visual and performing arts scholars and media and communication scholars. Third, the studies about the IB of media and communication scholars. Fourth, the most relevant studies that, from the archive's perspective of the "user" demands, have contributed to IB research related to the use of audiovisual media by different groups.

In section 7.5 the methods and research design of the study are presented. After, the findings section (§7.6), structured according to the research questions, includes: first, the film scholars' research areas and topics, and a brief description of how these topics originate (*RQ3.1*, §7.6.1). These topics are grouped into research focuses that are used in the subsequent sections. Second, there is a description of the main types of sources used by the scholars and their methods to obtain them (*RQ3.2*, §7.6.2). Third, the findings of the scholars' types of information needs and search strategies during research, teaching and non-job related tasks are presented (*RQ3.3*; §7.6.4). Fourth, the findings section finalizes with a characterization of the participants' searching behavior, and the role of information systems within it (*RQ3.4*, §7.6.5). Finally (§7.7), the chapter ends with the main conclusions of this study, and possible directions for future work.

Quotes from the participants are designated by the participant's number (e.g. p1) in this Study, followed by a letter (e.g., p1-a) which indicates an identified research focus (as it is

explained in Section 7.6.1). Occasionally, quotes from participants from Study B are used, in those cases it is indicated by the abbreviation SB followed by the participant's number in that study (e.g., SBp1). See also the Section "Writing conventions" at the beginning of this thesis).

7.2. Introduction and research questions

Different authors in the IB discipline conclude that the first studies about specialized information needs were focused on the sources and information systems themselves (books, journals, libraries, and the like) rather than on the personal needs and people's experiences with information. This focus was termed the "system-centered" perspective, which predominated until the 1970's, and to some extent still does[118].

As part of the shift towards people and their interactions with information, an important body of IB literature focuses on the information needs and seeking behavior of specific groups. Case (2012) defined three categories for organizing literature on IB by types of people: occupation (e.g., doctor, social scientist), social role of the individuals (e.g., student, television viewer), and demographic (e.g., by age or gender). As Case indicates, most studies in information seeking could be classified into the first category (p.285). Also, McKechnie, et al. (2002, as cited in Case, 2007, p. 268), found that 32% of the investigations of information seeking featured some kind of "worker", most often a type of professional, while another 17% concerned academics or other researchers. Wildemuth & Case (2010) also indicate that the future of this type of studies is necessary: "it is also likely that interest in the behaviors of academics and other information workers will continue to be a strong theme. They are the most intensive information users, so the additional study of their information behaviors is warranted."

IB research about work roles was developed first by studying scientists and engineers, and dominated the landscape from the 1940s to 1970s (Case, 2012, p.252). During the 1970's, research attention shifted to information transfer in the social sciences (Bates, 2009b). Around the 1980's, the studies transitioned to the humanities, as well as to other professions, such as managers, journalists, physicians or health providers (Bates, 2009b; Case, 2007).

This thesis focuses on film and media scholars[119]. There is no evidence of the existence of studies about the IB of film scholars to date, and about media scholars there are only a few (reviewed in §7.4.3). Indeed, most existing research on IB in the humanities has overlooked specific groups, such as dance, film, or theater, or has been done from a user studies perspective. This corresponds to a very specific focus on "user needs" mostly carried out by libraries in order to improve their services (see Chapter 3 for details about the IB perspective). Thus, there will be a gap in understanding how these users' information needs and information-seeking behavior in relation to moving images is changing as a result of the

[118] The history of IB as a discipline is explained in different sources, for instance in Case, 2012. Additional sources are cited in Chapter 3.
[119] The rationale for this choice is explained in Chapter 4.

proliferation of online information resources (Zach, 2009).

The study reported in this chapter originated from the necessity to understand information annotation behavior of moving images in the broader context of film and media scholars' information-seeking behavior, and to contribute to a better understanding of the information needs of this group of scholars.

This seems to be needed since there are different claims in the literature about the information needs from expert users; for example Smeaton (2007, p. 550) states that professionally created metadata are limited in supporting a "user's information seeking and searching requirements. Contrarily Andreano (2008, p. 95) indicates that looking for "clips containing a specified person or event, this sort of content-based retrieval cannot meet all of a user's needs."

For this purpose, a qualitative case study research was designed, with the aim of identifying the main scholars' cognitive (or emotional) processes and attitudes when seeking for moving images. A secondary objective was to understand the role of film archives in this context.

These are the study's **research questions**, which are part of the broader *RQ3* (Table 1.2):

RQ3.1. What are the most significant characteristics of the film and media scholars' research areas and research behavior in relation to topic selection?

RQ3.2. What kinds of sources are used by film and media scholars and what are the most significant characteristics of their methods for collecting and analyzing them?

RQ3.3. What are the most significant characteristics of film scholars' information needs and seeking processes for moving images in relation to their research and teaching tasks?

RQ3.4. Are there particular patterns in film scholars' search behavior? What kind of information systems do they use, and how?

Next, the main theoretical concepts that are the basis for this study are introduced.

7.3. Conceptual framework

This section presents an overview and definitions of the main theoretical concepts involved in this study. These concepts originate from the IB domain (information needs and requests; and information seeking and search behavior). Other related concepts are treated in other parts of this thesis: The concept of annotation and its types is developed in a previous chapter (Chapter 3). Additionally, the field of film and media studies and its main research perspectives are briefly defined in the introduction (§1.5).

7.3.1. Information needs and requests

The concept of information need is central to information-seeking research (Case, 2012; Naumer & Fisher, 2009; Savolainen, 2012). Information needs are the foundation on which

the seeking process rests (Fidel, 2012, p.83). Its meaning is subject to debate, and there is no agreed definition in the literature to date. Some authors claim that this concept should be studied within the broader area of "human needs" (Wilson, 1981), which are in turn studied by other disciplines. In that case, as Wilson (1981) explains, instead of using the term "information needs" in the IB professional vocabulary, speaking of "information seeking towards the satisfaction of needs" would be more precise. Even though specifying an information need is difficult, studying information needs is of importance both at a theoretical and a practical level, as it was stated in the motivation section for this thesis work (§1.2).

Naumer & Fisher (2009) also explain that the concept of information need varies according to the perspective, paradigm or information-seeking model to which it is applied, or from which it originates. Indeed, following the three perspectives of LIS research described in Chapter 3 (§3.2.1), the concept of information need could then be defined as a request for physical documents (information transfer model), as an expression of the individual user's cognitive levels (constructivist model or cognitive view), or as a socially constructed necessity (social constructionist view) (following the ideas by Tuominen et al., 2002).

With attention to terminology, Fidel (2012, p. 85) suggests that the term "**information problem**" is more accepted in current studies and views, and identifies a move to the concept of "task", as a motivation for searching for information. However, as she explains, the concept of task remains problematic since it does not necessarily lead to understanding the aspects of the task that trigger information seeking (p. 86). In this perspective, she concludes that the concept of task would not be a substitute for the concept of information need but a more tangible instrument (although not fully operationalizable) for the study of seeking behavior.

Indeed, within the cognitive view, in which there is an emphasis on "work tasks", information needs are supposed to have underlying motivating tasks. These tasks are "instigating factors of any information seeking activity" (Kirkegaard & Borlund, 2008, p. 117). Also, as Kirkegaard and Borlund explain, within the interactive nature of this view, information needs are conceived as multidimensional and potentially dynamic. According to Ingwersen & Järvelin (2005) the same task can lead to different information needs, depending on the perception of the individual user. This remark is the underlying rationale for Borlund's (2003) "simulated work task" scenarios[120].

Some authors have tried to differentiate the concept of "information needs" from the concepts of "**information wants**", or "**demands**" (Wilson, 1981; Green, 1990; Hjørland, 1997; as cited in Naumer & Fisher, 2009). Fidel describes this distinction as a way to narrow down the problematic concept of information need. Specifically, Fidel states that "information want" is what an actor thinks (s)he needs, "information demand" is what an actor says (s)he needs, and "information need" is what an actor actually needs (Fidel, 2012, p.85).

[120] The concept and method of "simulated work task" studies are used in Study B (Chapter 6).

The concept of “user request” is of importance in the study of information seeking behavior. The terms “demand”, “request”, “query”, or “enquire” (as it is used by Sandor & Enser, 2001), seem to be used interchangeably in the literature. In this chapter the term **“user requests”** is conceptualized according to Ingwersen and Järvelin (2005, p.20), who define information request as “the formulation of the information need or the underlying states of intentionality, as perceived, and provided at a given point in time by the actual searcher to an IR system or other information sources.” In this sense, the concept is used in relation to tangible expressions of an information need, “the compromised need,” in Taylor’s (1968) terms.

Studies on users’ information requests date back at least eighty years (Saracevic, Kantor, Chemis, & Trivison, 1988). Different researchers have approached the characteristics of questions from readers and users of information services through changing communication channels: from telephone, to email, to chat, to instant messaging, or to social question and answer sites. Current studies of **query analyses** come from the LIS field in the form of virtual reference transcript analysis (for instance, Radford & Connaway, 2013), or web content and e-book log analyses (Connaway & Snyder, 2005). Web server log analysis is also performed in Web searching studies, in which transactional logs are used to create user profiles in business analytics (Oliner, Ganapathi, & Xu, 2012).

Given these points, rather than assuming a restrictive definition of information needs (as tasks or demands), this particular study adopts a broader meaning, implicit in Wilson’s definition of “information need” as the motivations for information-seeking behavior. Consequently with this meaning, information-seeking behavior is seen as a result from the recognition of some need, as perceived by the “user” (Wilson, 1981) – or by an individual, in more general terms. For example, a scholar may request a production company’s specific file to a film archive, with the intention to find, for instance, a movie production costs. In this case, the information need is to obtain factual data (the costs), but the actual request to the archive is the specific production company’s file. Deeper motivations or layers of the information are studied in this chapter (e.g., why does the scholar need those production costs, which are the overall research questions for such a need for information or specific sources for consultation).

In addition, information needs have been categorized from different perspectives. The most influential **information needs’ classification** is Taylor's (1968) four-stage model for the expression of individuals' information needs or question formulation: (1) the actual but unexpressed need for information (the visceral need); (2) the conscious, within brain description of the need (the conscious need); (3) the formal statement of the need (the formalized need); and (4) the question as presented to the information system (the compromised need).

Within the cognitive perspective, there is a **typology of information needs** proposed by Ingwersen and Järvelin (2005) which is adopted in this thesis. According to Kirkegaard (2008) this typology also is based on Belkin and colleagues’ “ASK hypothesis,” Taylor’s theory on the development of the information need, the “label effect” (e.g., Ingwersen, 1982, as cited in

Kirkegaard, 2008), and previous work on fundamental types of information needs by Ingwersen and Järvelin, which includes Ingwersen's (1992) three types of information needs: verificative information need (factual-oriented), conscious topical information need, and muddled topical information need. The resulting categorization includes eight types of fundamental information needs which are defined next, based on Ingwersen & Järvelin (2005). In these definitions, the term "unstructured" refers to textual or visual content which is not machine readable, contrary to the term "structured," which mostly refers to data.

- **Known item**: Search for unstructured information objects or passages using known formal or bibliographic features (non-subject related metadata, such as title, or author).
- **Muddled item**: Search for unstructured information objects or passages using insufficient knowledge of formal or bibliographic features of *isness**.
- **Known data element**: Search for a priori structured information entities using other known structured data elements (e.g., searching for clients' addresses by towns, or looking for related terms in a thesaurus).
- **Muddled data element**: Search, mining or exploration for structured relational data entities when the feature relations are unknown a priori.
- **Known topic or contents**: Search for unstructured information (subject matter, contents or emotions) using known keys or features (commonly unstructured) of potential information sources.
- **Muddled topic or contents**: Search or exploration of unstructured information (subject matter, contents or emotions) using vaguely known identified or emotional contents, this includes ill-defined domain/work task.
- **Factual data**: Search for informative answers (facts) to conceptual questions by known content-associated or aboutness-related (unstructured) data.
- **Muddled Factual**: Search for informative unstructured answers (facts) to content-related or topical questions using ill-defined or vaguely known unstructured conceptual features.

Likewise, different researchers have developed **categories of users' demands**. A comprehensive review has been done by Numminen and Vakkari (2009), who merged previous taxonomies into an updated version that was used for their study on question types to the public library reference services in Finland. Their main categories include: Reference questions (among them for instance: ready reference, known-item search, known-item related search, subject-based research questions, topical search question); policy and procedural questions (availability and use of e-resources, procedural questions); directional questions; and other questions.

Finally, one of the key aspects of information needs research is the study of **relevance** and how the actors determine it. A "relevance revolution" (Robertson & Hancock-Beaulieu, as cited in Borlund, 2000b), in which requests were differentiated from information needs, and relevance by the need rather by the request, followed the cognitive revolution (the theory

that the nature of information needs as dynamic). Based on this, Saracevic (1996) proposes one of the most cited categories of relevance. According to him, relevance indicates a relation, and there are five manifestations of that relation:

- System or algorithmic (relation between a query and information objects in an IR system);
- Topical (relation between the subject or topic expressed in a query, and the topic or subject covered by retrieved texts);
- Cognitive (relation between the state of knowledge and cognitive information need of a user, and texts retrieved). It is also called "pertinence;"
- Situational (relation between the situation, task, or problem at hand, and texts retrieved); and
- Motivational or affective (relation between the intents, goals, and motivations of a user, and texts retrieved).

Studies on relevance are highly specialized (e.g., research on the system or algorithmic relevance) requiring more specific methods for studying them. This topic is outside the scope of this thesis. However, during the interviews performed in this study, special attention was given to the cognitive, situational and motivational relevance in a non-structured way, through observations and discussions (see §7.5).

7.3.2. Information seeking and search behavior

As Figure 3.1 indicates, there is a distinction between seeking and searching in IB studies: **Information seeking** is a consequence of having information needs; if there is a conscious requirement for information (or an underlying perceived work task), people engage in information-seeking activities. These consist of interacting with different sources of information (which may be humans, not necessarily documents), mediated by IR systems, or not (e.g., a telephone), in order to satisfy that need. Some researchers suggest that information needs only can be studied through externalized and directly observable seeking behaviors (Belkin and Vickery, 1985; Allen, 1996, p.56, as cited in Case, 2012).

On the other hand, at a "micro-level" there is **information searching** (Wilson, 2000), which is a kind of information-seeking behavior in which people only interact with information via IR systems. Actually, "the use of IR systems is one possible strategy in the collection of information and, hence, constitutes a potential sub-stage in the information-seeking process" (Wilson, 1999). Wilson (2000) clarifies that this can happen either at the level of human-computer interaction (e.g., clicks) or at the intellectual level (e.g., adopting a given search strategy). The trails left by the seeker in the system are what enable the study of information needs through demands or queries (e.g., via log analysis). At this micro-level, typical IR studies are about retrieval models, relevance feedback and ranking, query modification, auto indexing and weighting (based on P. Ingwersen presentation slides, May 30, 2013).

Apparently, in the **cognitive retrieval perspective** (described in Chapter 3) there is a less clear

distinction between information seeking and searching, which are considered more or less the same. This lack of distinction may be due to the assumption that both seeking and searching occur by using interactive IR systems. The difference with other views that clearly specify a distinction between seeking and searching is a broader conception of an IR system as being interactive, i.e., an IR system is not isolated from "*information space, IT* setting, *interface* functionalities and its environment" (Ingwersen & Järvelin, 2005, p.386).

Additionally, in current times when information systems are ubiquitous and pervasive, the differences between information seeking and searching are in any case also becoming blurred, that is, the situations in which information seeking happens without even a minimum support of an information system are less frequent. In turn, information seeking activities are also happening inside or mediated by information systems, as for instance, when people look for advice in online fora, using people as information sources, through the mediation of online IR systems. This last tendency is reflected in new studies on online-seeking behavior. In this thesis though, both concepts are still differentiated, as defined above.

After having presented the terminology related to the IB field in this section, the next section introduces the background research on the information needs, seeking and search behavior of specific groups of humanities scholars.

7.4. Literature review: humanities scholars information behavior in relation to moving images

As it was observed in the introductory chapter (§1.5), film and media scholars define themselves as humanities scholars. For this reason, this section presents an extensive though not comprehensive literature review on the information needs, seeking and search behavior by different groups of humanists[121]. The first part of this review (§7.4.1) presents the literature from the medium perspective, including studies of the use of audiovisual media by humanities scholars. Next, the IB of a subgroup of humanities scholars (performing and visual arts) is reviewed (§7.4.2). After that, the focus moves to media and communication scholars (§7.4.3)[122]. Additionally, since the concept of "user request" is tied to the concept of "user

[121] The literature in this section is reviewed based on a distinction between an "IB perspective", which focuses on groups of scholars, and on a so called "user studies" perspective described in Chapter 3. This second perspective is not fully explored. This means that investigations tightly related to the use of specific library collections by general "user" groups of humanities scholars have only occasionally been selected. Only representative works have been included in §7.4.4., which consists of studies carried out by audiovisual or media archives, or similar cultural heritage institutions, with a focus on general user demands, in the context of services' design or improvement. Additionally, there is abundant literature about the use of specific media (e.g., still photographs) by mixed or undetermined "user" groups. Part of this literature has been reviewed in Chapter 2, with a focus on how audiovisual sources are described with the aim of providing access to them: these studies usually involve groups of users, but the intention is to derive models for audiovisual materials descriptions.

[122] The search for the literature on IB in these disciplines was carried out by combining three searches: 1) using the terms "information behavior", or "information seeking" or "seeking behavior", also with the British variant "behaviour"; 2) a search with any of these keywords: "performing arts", "visual arts" (or artists), "cultural heritage", "cultural studies", "film", "cinema", "audiovisual", "moving image", "photography", "radio", "television", "media", "media studies", "communication", "video", "music"; and 3) a search for any of these keywords: "scholar(s)", "academic(s)",

needs" and its typologies, there is a review of the literature about user requests to film and media archives[123] (§7.4.4).

7.4.1. Use of audiovisual materials by humanities scholars

Auffret and Prié (1999) described how humanities scholars use audiovisual documents. Their description is based on a review of relevant literature, not on direct investigations. The authors observe that the most common ways of working with audiovisual documents in this group are: as pedagogical tools (in courses, lectures, conferences); as testimony of the past (for historians in particular); as works of art (by critics); as personal notes (mainly by anthropologists, sociologists, psychologists, education specialists, who record events for posterior analysis); and as communication acts (by semioticians who look at audiovisual productions in relation to meaning). Auffret and Prié advocate that random access to the content, or to any segment of the audiovisual sources through full-indexing "is a necessary condition if scholars are to develop new practices in using AV [audiovisual] material". The authors further discuss the problems associated with the indexing issues related to this kind of access (see Chapter 2 for more details).

Bates (2001) reviews the literature on scholars' use of multimedia in an excerpt from her 1999 report of a Getty Information Institute's project on online database use by scholars. She found that there was little research on the topic until then, but that prior investigations about the general characteristics of the humanists IB and their use of computer technology could have implications for understanding multimedia use. Probably due to the novelty of the use of Internet in the period when Bates' study was conducted, or because of this gap in the literature that she points out, Bates' review about the use of multimedia by scholars is mostly focused on the general issue of the adoptions of new technologies and media in scholarship. In that scope, her review draws the conclusion that the embracement of any new type of source will be shaped by previous practices or "research behavior" shared by the scholars' community. This conclusion agrees with the findings of the aforementioned broader project, in which scholars "tended to fit searching of the databases around pre-existing, and somewhat different, research practices than the databases were designed for" (Bates, 2001).

Finally, Skov & Lykke (2012) studied the information seeking behavior of humanities scholars

"researcher(s), "phd", "doctoral students", "faculty". The selected fields (combined or individually, depending on the database) were: title, abstract, and keywords. The search was performed in the databases Scopus (social sciences & humanities), WoS (Arts & humanities and Social sciences citation indexes), LISA and LISTA, with no time restriction, limited to academic articles, conference proceedings, and eventually book chapters. Only papers in English were selected. I also did reference chaining and selected additional papers when they were not included in the initial list of 23 papers. Additionally to the previous papers, relevant conferences in the IB area were directly revised, by looking for studies devoted to film and media scholars only: the ISIC (the Information Behaviour Conference), and IiIx (Interactive Information and Retrieval). Finally, one of the main journals of film scholarship, "The moving image journal" was scanned for articles about scholars' information seeking and use. The selected papers were reviewed mainly with focus on the information needs, preferred sources of information, types of demands, and seeking behavior.

[123] These users may not necessarily be film and media scholars, but it was considered relevant to include this section in order to observe how actual requests to film and media archives may connect to typologies of information needs that will be described later in this chapter in relation to film and media scholars.

dedicated to radio research. Although their general aim is to inform the design of the information processing system that will facilitate access to "one million hours of radio programs available to humanities researchers" (Lund, Bogers, Larsen, & Lykke, 2013), the study is done from an IB perspective, and thus provides insights into the scholars' needs in relation to radio sources. Relevant findings are cited next:

- There is a rich variety of research perspectives on radiophonic cultural heritage.
- The information needs related to radio broadcasts can be linked to one of the following four main categories: Content elements, Sound elements, Broadcast elements, and Radio production and structure of programming elements.
- In relation to access levels, most respondents (79%) search for a specific radio program, and 48% of the respondents find it important to locate a part (or section) of a radio program. The results provide evidence for a need to address several indexing levels in audio archives and thereby enable access to broadcasts at different levels of granularity.

Next, the literature about the IB of subgroups of humanities scholars regardless of any specific medium is reviewed.

7.4.2. Performing and visual arts scholars

Studies about humanities scholars from an IB perspective date back to 1956 (Stone, 1982). Burchard (1965, as cited in Bouazza, 1989) performed one of the early studies looking at how humanities scholars use a library. Bates (2009b) points to the fact that only in the 1980's and 1990's research on humanists IB started to receive funding. Indeed, Bouazza (1989) claims that as information users, humanists have largely been overlooked (p.152).

Hence, studies focused on the humanists' IB are then not older than circa sixty years, and the topic does not seem to have been central to initial IB studies. However, understanding the needs, seeking and searching behavior of humanities scholars seems to be highly relevant in the current context of the "digital humanities". Still, there is no comprehensive review of the literature on this topic to date (Case, 2012), and it is not the aim of this study to undertake it, since this would require a broader approach and more general research questions[124]. Because

[124] Indeed, as (Collins & Jubb, 2012, p. 179) indicate, "Few researchers have attempted the herculean task of understanding all academics' information behaviours at every stage of the research cycle". However, there are comprehensive studies on humanities scholars (and several that include also social scientists). This is because it is commonly recognized that scholars in the humanities have different needs and information-related behavior from both physical scientists and social scientists (Bouazza, 1989). Even though it is not done for this thesis, the point of departure for a study on humanities scholars' IB could begin from the three major existing literature reviews (reported by Case, 2012), which cover specific periods: The first systematic review on the topic is done by Stone (1982), which is one of the most cited articles in the pre-1990 literature on the topic (according to Watson-Boone, 1994). Additionally, Bouazza (1989) and Watson-Boone (1994) are also entry points to the literature of this pre-90s period (Case also suggests Gould, 1988, but this is not precisely a literature review). The review by Palmer & Neumann (2002) is important for studies between 1990s and 2000; in this period, also the papers from the series of reports that The Getty Art History Information Program carried out on a two-year project to study how humanities scholars operate as end users of online databases are highly relevant. Likewise, useful for this period are Pankake (1991) and Walker & Atkinson (1991). Case (2012) reviews works from 1984 to 2010. Zach (2009) and Benardou, Constantopoulos, Dallas, & Gavrilis (2010)

there do not seem to be specific studies about film scholars' IB to date[125], this review focuses on specific subgroups in the humanities discipline, which have audio-visual sources as objects of study.

Common divisions of the disciplines indicate that the humanities include the study of all languages and literatures, the arts, history, and philosophy; within the arts, traditional categories include the visual arts (painting, drawing, photography, etc.), the graphic arts, the plastic arts, the decorative arts, the performing arts (dance, theater, music), music (as composition) and architecture ("Humanities," 2015). This section of the review is limited to subgroups of humanities scholars which can be considered as having a direct interest in audiovisual sources: performing arts scholars (film and video), music scholars, and visual arts scholars. Although radio and television are also considered part of the performing arts, the review about these groups is included in the media and communication scholars section (§7.4.3).

Most literature about performing arts scholars' IB focuses on **music scholars** or **visual art scholars**. Indeed, Case (2012) identifies that the main humanities' groups studied (from 2002 to 2012) have been historians, followed by music historians, mixed groups of humanities scholars, literary, Jewish studies and art scholars, women's or genre researchers, practicing artists and art administrators.

7.4.2.1.Music scholars

In relation to **music scholars**, Brown (2002) identified that research about the information behavior of this group "is incomplete and anecdotal", and that mostly all what is known about their IB derives from larger studies of several humanistic disciplines. Brown systematically studied the research process of music scholarship by means of timeline interviews and a large survey in North America. The final research process model consists of six stages: idea generation, background work, preparing and organizing, analyzing, writing and revision, and dissemination. Brown also found that music scholars intensively use primary sources (e.g., letters, files, and manuscripts) together with secondary sources (e.g., journal articles), followed by music recordings in the first stage of the research process.

Even though it is not looking at music scholars, but at musicians themselves, the study by Winget (2008) is an exception in the area of information use behavior. Winget found several studies about the use of specialized IR systems by music seekers, but very few about musicians interacting with their primary information object: the musical score. The approach

summarize previous findings from all periods. There is no updated review for the period between 2011 and 2015, which is an important future work, due flourishing research in the "Digital humanities" area. The literature before 2011 focuses in the characteristics of humanities scholars' general information behavior, partially looking at the adoption of information technologies by the researchers, but updated research is needed to understand whether the humanities disciplines are being transformed by these technologies.

[125] Most literature about the topic of searching and using film materials falls within the so called "Film research", which should not be confused with the work or research done by film or other scholars. See more about the "film researcher" in §2.3.3 and §7.4.4.2.

taken by Winget, by looking at the musician's annotations as evidence of their interaction with music, is very rare in IB studies, and very insightful for the aims of this thesis (see Chapter 6).

More recent studies in the area of music IB relate to the use of library collections and services. For instance, Lai & Chan (2010) analyzed the requirements for improving the Western music collections for university students at a Chinese university; Clark (2014) studied the needs of online music graduate students at a Performing Arts university library. Current web-based services are studied by Dougan (2015), who investigated the search strategies and tools used by music students, including the library streaming tools and non-library platforms such as YouTube.

Altogether, there seem to be more studies in the area of seeking music for leisure, for everyday life situations (e.g., Cunningham, Reeves, & Britland, 2003; Laplante & Downie, 2011) or for work related tasks than about music scholars. In those cases, they seem to focus on specific groups of music fans or professionals. For instance, Inskip, MacFarlane, & Rafferty (2008) studied information seeking by creative professionals within the music industry, specifically when music accompanies moving images; Margree, Macfarlane, Price, & Robinson (2014) investigated the serious leisure IB of music record collectors; and Lingel (2013) researched the organizing practices of digital music by DJs. No equivalent was found in the video remix area, although there is a monography about the culture of "Vjing" (Ustarroz, 2013).

7.4.2.2. Visual art scholars

Likewise, even though studies about library usage by visual arts' groups conducted by information professionals are numerous (Larkin, 2010a), not many are from an IB perspective on the needs of visual art scholars. Sara Shatford Layne's study on art historians' ways of seeking complements her previous proposal for image analysis (Layne, 1986), which has been widely used in subsequent studies on semantic categories for image retrieval (see Chapters 2 and 5). Layne's (1994) study about the information-seeking and use of artists and art historians confirms that the literature on how art historians use and seek for visual information is relatively sparse (p.24). Layne uses the term "**visual information**" as opposite to "textual information", and encompasses these two concepts with the term "art information". **Art information**, as Layne defines it, "includes representations of works of art and text about those works; it also encompasses, more broadly, any information that may be used in the creation of art works or in understanding or giving context to those works" (Layne, 1994, p.24). Layne observed that the group of art historians had a distinctive research process and pointed out to their strong need for both visual and textual information. Layne also summarized the needs for visual information by artists and art historians (which will be discussed later), and the role of the reference librarian in supporting them.

The most cited studies about visual art scholars are Stam (1984), Brilliant (1988), and Rose

(2002). Stam (1984) investigated how art historians looked for information, characterizing the seeking process of this group of scholars as "contemplative undertaking involving objects of art, reproductions of those objects and related objects, and written descriptions and observations about works of art" (Stam, 1984). Brilliant's (1988) essay reveals details on how the scholar categories the studied objects. Brilliant explains that art-historical research concentrates on the art object itself, investigating, among others "matters of style, composition, motif, iconography, connoisseurship, the constitution of an artist's oeuvre, [or] the definition of figural repertories" (p.123). Rose (2002) investigated a group of art historians, looking at the impact of new technologies on the research behaviors, finding out that art historians have been slow in their adoption of technology as compared to scientists. Beaudoin (2005) explains that a possible reason for this slow adoption is that the art historians may see technologies as merely supplanting what was done manually, instead of significantly expanding research possibilities (p.36). Still, Rose (2002) found an intensive use of computers throughout the research process of art historians. As it was suggested before, more research is needed to understand whether current trends in the so-called "Digital humanities" are changing the nature of research questions and methods for art historians in this case.

Larkin (2010a) is one of the most comprehensive and current studies to date on visual art scholars. Her investigation is based on a preliminary study on Web-based image retrieval systems by visual art scholars (Larkin, 2007). Her research, reported in a later paper (Larkin, 2010b), included full-time faculty members in the department of the visual arts at three different universities in the US (32 scholars in her initial phase completed a questionnaire, and 19 completed all the study participating in an additional interview)[126]. Similarly to Layne (1994), Larkin's (2010a) study also concluded that most participants "relied on images in books as inspiration for their scholarly agendas". Additionally, Larkin observed that scholars were concerned with the quality of art reproductions, that author's reputation in regard to print resources was a determinant factor, and that most participants were dependent on home art libraries. Larkin also found that the majority of scholars used Web-based information retrieval systems, downloading images from the internet. Further findings of Larkin's study will be discussed later.

Literature related to the IB of practicing visual artists, which falls out of the scope of this study, was reviewed by Hemmig (2008), who attempted to build a model of practicing artists IB from their information needs and uses relevant to the creative activities, later studied empirically in Hemmig (2009). This author concluded that the main motivations for information seeking in this community included inspiration, seeking for specific visual elements, knowledge of materials and techniques, and marketing and career guidance. Hemmig also found that "personal life and social network is the most useful form of social information gathering for these artists". Finally, Mason and Robinson (2011) carried out

[126] Larkin (2010a) presents a detailed literature review about studies that have focused on visual art scholars, and on artists themselves. Only some of her cited papers are reviewed in this chapter.

another empirical investigation of this group, focusing on "emerging" artists and designers.

7.4.3. Media and communication scholars

Even though IB studies about the use of mass media proliferate (see for instance Case, 2012), and there are a few but important works that analyze user requests to film and other media archives (see Chapter 8), investigations from a group perspective about the needs and seeking behavior of media and communication scholars are scarce or non-existing (Kirkegaard, 2008, p. 52). This may be due to the fact that the discipline itself is relatively recent (see the discussion under §1.5).

Novel research on this topic is done by Kirkegaard & Borlund (2008), who in the context of a broader project about metadata use in television broadcast setting, selected a sample of scholars and students at the two main departments of Media Studies in Denmark. There were 108 participants filling in a questionnaire and 9 participants interviewed (one master student, two Ph.D. students, two assistant professors, two associate professors, and two full professors). The characteristics of this group are summarized by the authors as follows, and will be discussed in this chapter:

- Television broadcasts are needed for empirical analysis.
- The television broadcast needs are related to three broadcast dimensions: (a) the transmission dimension, (b) the archive dimension, and (c) the reception dimension.
- Four types of information needs of the studied group in a television broadcast context are identified; and
- The television broadcast information needs are divided into four phases.

Case (2012) also identifies a limited number of relevant works about the IB of journalists. Case identifies this profession with the "job of news reporting" and as being interested in "theories […] about people, society, events, and news itself" (p.313). Case sees this work intrinsically related to information seeking: "in a very concrete way, journalism is largely information seeking, along with the prime job of transferring what is found through writing, speaking, and/or filming" (p.313). The studies reported by Case about this group are mostly focused on professional work tasks, not on scholarly related ones.

Finally, a recent Ph.D thesis by Bron (2013) (published also in Bron, Gorp, & de Rijke, 2015) presents novel research into the information-seeking behavior research of media studies researchers based on research stages and research questions in the context of data-driven research. Media studies are understood in this case as a discipline situated both within the humanities and social sciences.

Apart from the research works described in this section, there is an increasing interest in understanding scholar's information general information needs in relation to cultural heritage collections in the context of large scale projects to disseminate digital cultural heritage online, which will be reviewed next.

7.4.4. Users' requests to film and media archives

Memory institutions have different mechanisms to support their users*. It is also recognized that consultation with users is more vital in audiovisual archives, due to the wide range of possible annotations, in order to tailor the policies for content description to their requirements (Wilkie, 1999). The provided services change historically depending on several factors, such as the nature of their different collections, the technologies available both for preservation and access, and the needs of the different communities they serve.

This section presents a literature review of the interaction that takes place between film and/or media archives and their user communities. The studies reviewed may or may not include scholars, but are still important to observe how user requests are categorized by the archives. This interaction is considered in two ways: (1) the traditional perspective of support offered by the archive to their different user communities to their "user requests"; and (2) the collaboration established between the archive and specific user communities, with focus on the relatively recent strategy of requirements elicitation for the collaborative creation of information systems.

7.4.4.1.User requests

The first studies about information requests in relation to audiovisual content to specific archives are in the area of visual documents. The first reported study is Seloff (1990), about the requests to the NASA-JSC image archive (as cited in Kirkegaard, 2008). Also Enser and McGregor (1992) and Enser & McGregor (1993) (both as cited in Enser, 2008a, 2008b). These authors analyzed around 2,700 requests by different user groups to the Hulton Deutsch collection (now part of Getty Images). Their analyzed users' requests showed that users focused on retrieving specific objects or events ("the study revealed that almost 70% of the requests were for a unique person, object or event, and that most of the other requests included refinements, mostly by time"). This interest in retrieving "named features" was also identified in different subsequent studies, as reported by Enser (2008a, 2008b). This type of request could be named as known-item for "passages" or fragments of contents, using the definition by Ingwersen and Järvelin (2005, p.292) presented above (§7.3.1).

Requests' analyses carried out (and/or published) by individual film or media archives are very scarce. Among them, Armitage and Enser's (1997) study of user queries addressed to seven libraries which hold still and moving image material; their subsequent VIRAMI Project (Sandom & Enser, 2001, 2002), the study of a German film archive by Hertzum (2003), and the analysis of logs from a media archive done by Huurnink, Snoek, et al., (2010).

Transaction log analyses in film or media archives are not frequent, as Huurnink, Snoek, et al., (2010) remark. This may be due to a lack of an open or comprehensive online catalog provided by each archive, or to the impossibility of autonomous searches due to inherent difficulties of representing images' information. That is why the few identified studies on users' requests are either based on some kind of mediation during the request, or on

unmediated queries expressed in emails, letters and/or faxes sent in by users to the archives (e.g., Armitage and Enser, 1997; Hertzum, 2003). Also Huurnink, Snoek, et al.'s, (2010) study used "purchased data" in their experiment, although they do not provide results based on these logs and data, but only use it to create the query set for their evaluation of CBIR systems (see also §2.4.2). However, the authors suggest that there is an increasing need for accessing moving image content at the shot level, since there is a growing demand for video fragments in broadcast archives. The authors indicate that access at this level accounted for 66% of purchases in one study of a broadcast archive (Huurnink, Hollink, et al., 2010).

Coming back to Armitage and Enser's (1997) study, they analyzed a set of circa 1,700 requests from seven different libraries, among them two with moving image collections: "The National Film and Television Archive" (NFTVA), maintained by the BFI (365 requests), and the BBC Natural History Unit (NHU) (301 requests). The first library serves general users with an interest in film and television, while the second one as mainly users interested in natural history. The authors found that at the NFTVA 40.3% of the requests were for known items, similarly to the 42.3% at the BBC NHU. From the analysis of the content features of the requested images, at the NFTVA 24.7% of the requests were for unique subjects (i.e.,"named individuals, one-off events, singular objects or locations"), and 32.3% for the non-unique subjects. The proportions at the BBC NHU were more dissimilar, with a 55.9% for non-unique subjects, and a 1.7% for unique subjects. These results suggest that at the NFTVA, users were mostly aware of the items they needed (via program's names or known topics). The differences in the unique subjects' requests at both archives, is explained by the fact that the subject domain of natural history (BBC NHU) is not common to "name or locate individual examples of plant or animal in precise settings" (p.289).

Later, the VIRAMI project carried by Sandom and Enser (2002), mentioned before (§2.3.2.5), is one of the most detailed investigations focusing on user requests to film and/or media archives, in this case in the UK. The findings of this study from the information providers' perspective (the archives), allow the identification of four categories of user groups (Sandom and Enser, 2002, p.13): (1) commercial: including archive clients seeking footage for commercial or production-related projects; (2) education, including all clients seeking footage for teaching and academic research, as well as students; (3) individual: people searching for visual information for their particular interest, and (4) non-commercial: including organizations such as libraries, film societies, clubs, etc. Sandom and Enser found that the majority of the enquiries came from the commercial user group (73% of their 1,270 requests sample). The authors focused their subsequent analysis in this set. Contrarily to the study by Armitage and Enser (1997), the VIRAMI project found that of the 1,270 requests, only 122 were for known items (i.e., requests based on titles, directors, or actors). The majority of the requests were for films that illustrate specific events, showing named individuals or groups of people, in particular places or on unique dates. The great number of "content" requests in this case, may be explained by the fact that the majority of the data sample, 73% of the requests, came from commercial enquires (i.e., clients looking for footage) as indicated above. The authors also observe that approximatelly 30% of the requests would need a shot

level description (i.e., shot lists) in order to be satisfied.

Hertzum (2002) analyzed the requests sent via e-mail over a one year period by all types of users of a national film archive in Germany. A sample of 275 emails was categorized using different criteria. In what concerns the user groups, only 57% of this sample provided data that could be used for the grouping. In this final sample, 22% of the requests came from student work and theses; 10% from festivals and exhibitions; 9% were family-related research and events; 8% corresponded to academic research and teaching; 7% to commercial activities. Hertzum (2002) investigated the way the requests were formulated by the users (i.e., which attributes are used by the requesters), as well as the access points offered by the film archive's database or in automatic retrieval systems that meet those requests. He found that most requests specified details about specific films, such as title, production year and director, which indicate that most requests are of the known-item type (p.175). Further, Hertzum reports that the film archive database of his case study indeed provided traditional access points derived from individual items' cataloging, but support to other type of requests were not possible due to this "narrow view of the material", in which subject access is limited, and possibilities to access the content of the media works are null. Hertzum concludes that in order to support the users, it is necessary to "acknowledge the archivists' capabilities as expert intermediaries and to create direct retrieval systems that support the archivists in their work with the collection and with requests from the users of the archive (Hertzum, 2002, p.184).

The previous studies focused on studying the requests to audiovisual archives by all types of user groups. Other studies have a more IB-oriented focus, and thus look at specific groups. For instance, a quite unique study by Amin et al. (2008) investigated the information seeking behavior of cultural heritage experts. This study is not focused on the requests' analysis per se, but on the needs and seeking strategies of the professional intermediaries who perform the searches in order to serve the users (as Hertzum's, 2002 study suggested). In the study, seventeen experts from nine cultural heritage institutes in the Netherlands were interviewed and asked to answer questionnaires about their daily search activities. This study is relevant since some of the participants work with visual information. The identified types of needs from this group of professionals were: fact finding (i.e., "factual data" as defined in §7.3.1.), information gathering, and keeping up to date. The information gathering need includes more complex tasks than simple look-up, for instance: comparison, relationship search (i.e., connecting scattered pieces of data), topic search (mostly "known topic" as defined in §7.3.1), exploration, and combination (i.e., connecting information from different sources).

Another highly interesting group of professionals whose work is essentially related to the task of finding moving images is the **"film researcher"**[127]. The film researcher is the person responsible for searching, retrieving, analyzing, organizing, and preserving audiovisual materials and related information that is required during the process of making an

[127] The term is not to be confused with "film scholar."

audiovisual product (López de Solis, 2013[128]) (see also §2.5.3). There are several guides that are meant to support the work of this professional, and consequently provide detailed lists of archives where to find moving images according to diverse characteristics. But studies about the information seeking behavior of this group are very scarce. An exception is Simpson-Young and Yap (1995), a technical report published twenty years ago about the work processes of film and television researchers. The study was done through interviews to film and television researchers, filmmakers and film librarians. It had the aim to know the film and television researchers' needs for remote access to video archives during the production process. The findings showed that the seeking behavior of this group of people when searching for source* material includes several activities, among them: talking to people (e.g., staff at film libraries, filmmakers, and researchers), searching catalogs, reading shot lists, and reading screening notes. The report also shows that it is common to rely on the good memory of those acquainted with the material, and that one key skill of the film or television researcher is to know the details about the different archives and their holdings. There were complains about the limitations of film library catalogs back then, which often did not include all available titles or had little content information such as synopses or keywords (p.4).

7.4.4.2.Requirements elicitation

Currently, several information systems are being developed taking advantage of new possibilities to information service provision facilitated by advancedments in automatic data processing, large-scale digitization, Linked Open Data, and an increased facility to acquire sophisticated computer equipments. Several online services offer aggregated data from different collections (e.g., Europeana). In order to design or promote the use of these sytems, there is a need to conduct studies with potential users, which are often called "requirement elicitation studies"[129], or "wants and needs analysis" (W&N)[130].

The most relevant examples of projects which are carrying these types of studies in order to support researchers and promote the use of audiovisual heritage are "Europeana Cloud" [(rw)], the "EuscreenXL" project[(rw)] and the "Axes" project[(rw)]. Their requirements studies generally address three user groups: the general public, researchers (digital humanities), and the creative industries (content delivery) (EUscreenXL, 2013). Also, in the context of audiovisual archiving and research, there are additional targetted groups: archivists and broadcast

[128] Translated and adapted from the original in Spanish (p.15). More about this professional and their needs is discussed in §7.6.1.3.

[129] These are some definitions and characteristics of this type of study: "A user requirement is a statement (by the user) about an intended product that specifies what it should do or how it should perform" (Preece et al. 2002, as cited in Kunert, 2009). "User requirements refers to the features/attributes your product should have or how it should perform from the users' perspective" (Baxter & Courage, 2005). "User requirements must be captured correctly, and they have to be realistic and achievable" (Charvat, 2003).

[130] "The W&N analysis provides information about the kinds of content, features, and characteristics users want and need in a product. This brainstorming activity works for any product or service and results in a prioritized list of users' wants and needs. This technique can be used to both validate current feature plans as well as to learn about new features that users would find valuable. Although it can be used at any time, this technique provides the most benefit when used during the conceptual stage of product development" (Baxter & Courage, 2005)

professionals, and journalists[131]. A brief description of the work and findings of these three projects is presented next.

The "**Europeana Cloud**" initiative is a Europeana[132] project which intends, among other things, "give researchers new services and tools, with which they can access, work on and share the content stored in the Cloud" (Dunning, 2015). One of the four project packages focuses on "research needs[133]." To date (April 2015), two expert forums and a workshop have been carried out. Although these events focus on the potential use of the so-called "cultural data" for researchers in the humanities and social sciences (Edmond, Garnett, & Benardou, 2014), there is no specific focus on audiovisual materials[134] or in the discipline of film and media scholarship. However, since Europeana also includes television and film content from different media archives in Europe, some of the main researchers' needs identified by this project so far can be of general importance:

- The need for technological knowledge for understanding, or performing the task of data extraction from the information systems which provide the data, in a way that is adjusted to the scholars' research questions.
- The need for filtering the data at different levels of granularity.
- The need to know what data processing possibilities exist, what is possible to do, and how. Indeed, the report by Edmon et al., 2014 talks about the "unknown unknowns," meaning that developers and data providers often overlook that humanists may not be aware of the existing options and mechanisms to process data.

"EuscreenXL"[(rw)] is a European project that runs from 2013 to 2016, as the continuation of the "Euscreen" project (2009 – 2012). It aims to improve and develop access to the Euscreen portal. It is constituted by a network that brings together 32 partners from over twenty different European countries. Euscreen is an aggregator and portal for Europe's Audiovisual Heritage. This initiative comes from the television sector. Among other things, the network focuses on the requirements of providing audiovisual content to researchers, since these have been identified as one of the most important user groups of heritage data. EuScreenXL uses the outputs of the studies conducted by the aforementioned Europeana Cloud project, which is addressing this topic on a more general level, and adapts them to the context of

[131] Indeed, the "extra" study conducted during this Ph.D project at EYE (see §4.4), indicated the existence of four main types of user groups in the archive: general "casual" users (since one of the main emphasis of the institution is on exhibition); researchers and students (mostly users of the library and the archival collections); the film industry and press related groups (directors, exhibitors, festivals, and the like); and internal users (the EYE staff who requires documentation and intensive use of the collection). The third group was very important for the archive's exhibition activities.

[132] Europeana is the European organization that created and maintains the information system of the same name which provides access to the records and digitized objects from important libraries, archives, museums and galleries in Europe (more than 3,000 aggregators and data providers in 2015) (http://pro.europeana.eu/page/how-to-contribute-data). These objects include, as stated on the Europeana website: books and manuscripts, photos and paintings, television and film, sculpture and crafts, diaries and maps, sheet music and recordings.

[133] The Europeana Cloud project[(rw)] Work Package 1 focuses on research needs. Some of their deliverables and related documents are cited in the text. They were available at the project website (accessed on April 15, 2015).

[134] "In the context of Europeana, sound and video occupy less than 1% of its content, a fact that reveals a substantial lack of such material among its collections" (Benardou et al., 2013).

audiovisual heritage (Kovács, Markovich, Verbruggen, & Schuurman, 2013). The specific strategy carried out by EuscreenXL in terms of identifying the researchers' needs for audiovisual materials is to develop workshops to engage scholars and digital humanities experts both in practice and discussions about the implications of using audiovisual heritage in humanities research.

The "Access to Audiovisual Archives" (Axes) project[(rw)], also European (2011-2015), attempts to develop information systems that facilitate engagement and use of audiovisual collections. In order to be designed according to the needs of their identified user groups (professional, research, and home users), a requirements study was conducted. The study of researchers need was approached through a survey about the use of current search engines and databases in research. The outcomes of this survey will be discussed later in this chapter (§7.6.4.1).

To conclude this section, it seems that in what concerns the study of information needs from an IB perspective, a pattern appears to emerge from the studies reviewed in this section. Often, there is a somehow "imposed need" to the scholars from the information services providers. Indeed, it seems that great part the users of cultural heritage APIs are still developers and computer scientists (Edmond et al., 2014). Hence, there is an apparent switch from looking at existing needs of the scholars and respond accordingly, to showing the potentials of current information technologies in order to encourage their use.

7.5. Study design

This section relates to the theoretical framework proposed in Chapter 3 (§3.6.1), which depicts the actor as the central component of the model, the most important "actor dimension" is the actor's declarative knowledge and procedural skills related to natural work tasks, and the actor's perception of her/his interactions with the "information space" through interfaces, in terms of importance to accomplish research and teaching related tasks.

The following sections explain the study design, according to the research terminology used in this thesis (§4.2).

7.5.1. Method

Investigations about information needs are done using different approaches, the most important being the examination of queries or requests, in what is called "query analysis" (see Chapter 8); surveys and structured questionnaires; or by using qualitative methods (see Chapter 4). The INISS Project (a study of information use in local authority social services departments), directed by Tom Wilson and David Streatfield, is commonly cited as the first big scale qualitative study in this domain. It used the action research method and structured observation as data collection. Even though Wilson also advocates that quantitative methods have a role to play, this study impacted future choice of research methods in the field: "It was

this method that revealed, to all of the team members, the value of direct engagement with the practitioners, and it led to my championing of qualitative methods as a necessary part of the research process" (Wilson, 2011).

Since the current study described here seems to be one of the first ones about film scholars' IB, this first approach is qualitative and interpretative. The method chosen for the investigation in this thesis is a case study of a group of film and media scholars within the faculty of humanities of a distinguished Dutch university (§7.5.2). The approach taken in this study follows two recommendations: First, Ingwersen and Järvelin (2005) advice to focus on the cognitive actors and their perceptions and use of information objects. Second, Kuhlthau's (1991) remark about the importance of identifying the information needs of each group in terms of its own particular information environment, since task and discipline influence information seeking behavior.

7.5.2. Data collection techniques

The data collection techniques consist of an in-depth semi-structured interview, which included pre-established questions (themes that were guided by this thesis' research questions, in combination with others that emerged from topics found in the literature of humanists' information behavior). This type of interview allows the participants for open-ended answers with no limited set of response categories (Pickard, 2007, p. 175). Additionally, the interview was based on the "critical incident method" (Ingwersen & Järvelin, 2005; Kirkegaard, 2008). This approach tries to make the participants recall a specific situation and/or on a concrete incident they faced when looking for information. In this study, the situation that motivated the discussion was a recent research project carried out by the participant.

Previously to the interview, the researcher read carefully each participant's website or blog, CV (if available on the university website), and a sample of their publications to get acquainted with their topics. Interviews were complemented with notes from observation of the film scholars' daily work. This was possible thanks to a research stage that took place over a three-month period. During this period, this thesis' author had the chance to interact with the film scholars on a daily basis and take part in the academic activities organized by the Department. Besides, it was possible to use the Ph.D. students' office daily, having the chance to observe and interact with young researchers in this area.

7.5.3. Selection of participants

As it was explained in the methodology chapter (Chapter 4), this thesis' individual case studies include film experts from different parts of the Western world (Study A), Spain (Study B, and from two institutions based in the Netherlands (Studies C and D). This last country was selected for the studies since there is active research in the field of digital humanities, combined with the leading and innovative work of their main audiovisual archives: The

Netherlands Institute for Sound and Vision (Nederlands Instituut voor Beeld en Geluid), and the EYE Film Institute Netherlands.

This particular study (Study C), took place at the Department of Media and Culture Studies, Theatre, Film and Television Studies, at Utrecht University, more specifically at The Institute for Cultural Inquiry (ICON), one of the four research institutes of the Faculty of Humanities. This university and this particular department lead important research projects or groups related to audiovisual heritage in Europe, such as EUscreen (Portal for Europe's Audiovisual Heritage). Additionally, there is active research carried out by the Digital humanities Lab, Miracle (Centre for the Study of Moving Image, Cinema and Screen Media), and the Center for the Study of Digital Games and Play. Finally, an active monthly seminar about film studies lead by Professor Frank Kessler was a fruitful event for this study, since researchers had the chance to discuss their research projects to obtain feedback.

The participants were selected through purposive sampling, based on research area (mostly film and media scholars, but also a few television scholars) and experience (mostly professors, but also some Ph.D. students and young scholars). Two external researchers also participated. Even though they did not formally belong to Utrecht University, they were close to the research community and/or for were affiliated researchers. The final group consisted of fourteen participants, which characteristics are presented in Table 7.1.

Table 7.1. Participants Study C.

Participant	Academic status	Age	Main research area	Research focus[135]
P1	Professor	50-60	Film and media studies	Aesthetic/narratological
P2	Associate professor-senior researcher	40-50	Film, theater, and television studies	Epistemological
P3	Assistant professor	40-50	Film and theater	Social media history
P4	Assistant professor	40-50	Television studies	Social media history
P5	Lecturer	30-40	Film and television studies	Aesthetic/narratological
P6	Lecturer	30-40	Television studies	Aesthetic/narratological
P7	Assistant professor	30-40	Media studies	Epistemological
P8	Assistant professor-senior researcher	40-50	Film and television studies	Social media history
P9	External researcher	40-50	German literature and film studies	Aesthetic/narratological
P10	Affiliated researcher	30-40	Media and film studies	Cultural/Documental
P11	Ph.D. student	30-40	Media and film studies	Cultural/Documental
P12	Ph.D. student	50-60	Film studies	Aesthetic/narratological
P13	Ph.D. student	30-40	Media studies	Social media history
P14	Ph.D. student	30-40	Film studies	Aesthetic/narratological

7.5.4. Protocol and interview guide

The main data collection technique, as mentioned above, was an in-depth semi-structured interview, which consisted of seven parts. These are detailed in the interview protocol (Appendix J) and summarized as follows:

[135] These research focuses will be explained later (§7.6.2); the categories in this column are part of the analysis made by the author of this thesis, thus they do not correspond to any standard academic categories. Also, they are not mutually exclusive, since one scholar may switch to different perspectives depending on the projects. Only one is chosen here since, as it will be explained in the protocol description, each participant was requested to choose only one project for discussing during the interview.

- Part 1 was an introduction to the study.
- Part 2 included open questions about the participant's background research, area, and topics.
- In Part 3 the participant was asked to select a specific research situation in order to describe the motivation for selecting the topic, the broad method and stages of the research process, the sources and the ways they were located or sought, and finally, to explain how common they thought this situation was among their peers.
- Part 4 included the same type of questions, but about a teaching situation.
- Part 5 consisted of a brief discussion about leisure, how films are chosen for "non-work" related activities; since this topic was not precisely the main focus of this study, this part was skipped or left for the end when the previous parts were taking longer than planned.
- Part 6 consisted of several questions about the participant's information search behavior and use of particular IR systems; the participants were presented with a list of systems which could serve as starting points for the discussion; and were asked to rate on a Likert scale the use of the selected systems and comment or complement their choices. Finally,
- Part 7 included questions about how participants analyzed their sources in their selected research project (the same or different from situation 1); this part also included closed questions about the use of certain types of tags or keywords for searching, their eventual use of socially generated time-based annotations, and their experience with tagging and online commenting.

The interviews lasted for approximately one hour and a half. The audio of each session was recorded, after indicating procedures for anonymity. The interviews took place at the participants' offices in order to facilitate observation of their workspace, and to allow the researchers to have their own computer at hand, in case there was a need to perform a search, use locally stored bookmarks, or use specific documents at hand. Only in four cases the interview took place in a meeting room at the university.

The other data collection procedure (i.e., participant observation), was done in a non-structured way, only guided by the research questions.

7.5.5. Data analysis procedures

Each interview was recorded and subsequently transcribed. The procedure for coding is the same as described in Section 4.7.

As a complement to the interviews, a basic analysis of a selection of the scholars´ published papers (as in Palmer & Neumann, 2002) was performed during the stage (as a way to know more in detail the work done by the scholars), and during the report writing phase (in order to validate some of the findings). This was done by selecting a small sample of the publications listed on each participant's university profile page, in order to verify their

background, research area and methods.

The validity of the findings was verified in two ways: first, the preliminary outcomes were discussed at one of the aforementioned monthly "Film seminars" that take place at the Utrecht University's department, during the period of the stage. Secondly, after the complete analysis was finished, the final draft paper was given to one of the senior participants. This was done with two purposes: requesting general reading and commenting, and/or asking to check that the findings were accurate and correctly contextualized. Due to time constraints of the participants, the interviews transcripts were not handed in to each one of them.

7.5.6. Limitations

The fact of being a case study within the borders of a specific university department, make transferability of the results difficult. However, the majority of the findings can be compared with equivalent findings in IB-related publications of humanities scholars, which may be an indicator of their validity.

7.6. Findings and discussion

This section presents the findings of Study C according to the research questions described in section 7.2. Bordwell (1989) declared in his book: "Except for a few polemical stretches, the book seeks to survey interpretive practice with the ethnographer's calm curiosity" (p.xii), this is the case in this chapter.

7.6.1. Research topics

This section presents the findings of this study's first research question (*RQ3.1*), describing the most significant characteristics of the film and media scholars' research areas and research behavior in relation to topic selection. The broad topics[136] of the study's participants are diverse, covering areas of film, television and media studies:

- Cinema studies, social history, and political economy;
- City symphonies;
- Emergence of cinematography (early non-fiction cinema and French magic films);
- German television films;
- History of film-going;
- Inter-titles and narrative film;
- Madness and media, medical film collections, history of media archives, film historiography, media archeology and color in early films;

[136] I talk mostly about "research topics" and not about "research questions". This is because the latter term is not commonly used among the interviewed film and media scholars. In certain cases, I use the term "research question", meaning a more focused inquire within the broad topic, but the term itself may not have been used by the scholar.

- Media archeology (comparative analysis of emerging media);
- New media and digital culture;
- Production, dissemination and reception of early cinema;
- Religion in contemporary films;
- Transnational television;
- Video culture; and
- Visual media and intermediality in the 19th century.

By observing the participants' research topics, one could get the idea that there are as many topics as scholars. Indeed, it is common in this discipline to have a "personal topic"(p5-a), and "establish a name" based on this selection(p5-a). This corresponds to one of the traits of the work of the humanities scholar identified in early studies, in which "constructing a subjective awareness on a factual framework is seen to be the essence of humanities scholarship" (Immroth, 1972, as cited in Stone, 1982). Indeed, when discussing about finding their own way or directions, scholars often used the words "intuition", "inventive", "trusting my own sense", and being able to take "independent decisions". It is also commonly reported that individual viewpoints and interpretations are part of the overall contribution to knowledge in the humanities (Fyre 1973, as cited in Bouazza, 1989). In 1979, Fabian and Vierhaus (as cited in Bouazza, 1989) suggested that the individual approach in the humanities would continue in the future despite changes in approaches and methods brought about by computerization. Watson-Boone (1994) confirmed that personal interpretation of material by the humanist was still central to the conclusions reached.

The research **topics originate**, in certain cases, from "personal fascinations"(p9-a), or unique life experiences(p10-cd). In other cases, they emerge within the framework of broader research projects, in which the researcher had the freedom to choose an approach to handle the material and proposed subject(p6-a)[137].

In some cases, research topics emerge from the film archives, from the need to understand specific collections. When this occurs, it is often caused by the novelty of rediscovered materials or for the lack of previous research about them by archivists, curators, or scholars. Two examples were described by the participants: one, a collection of old dramaturgy booklets, used for staging the plays from 19th century to today kept at a municipal archive; when the research community knew about this collection, projects at different levels (institutional, national, international) were started, calling for the participation of individual researchers to focus on specific aspects(p1-a). A second case is current research on medical films; one participant explains that several collections have been found in different countries (sometimes re-discovered during digitization projects), which motivated the creation of a

[137] Coincidentally, the last one is the case of three of the four interviewed PhD students. In relation to this, one scholar suggested that the Bologna education framework is leading researchers towards a preference for "external" frameworks, in a project-oriented way of thinking, which is different from her/his generation in which topics originated from an individual "urge" to see certain materials and research about them (p9-a). Another scholar comments that this way of funding based on projects is changing humanities research, making it more "programmatic" and tied to "research agendas".

research network around the topic(p10-cd).

Literature about humanities scholars' IB does not specifically analyze the issue of how **research topics are found**. In the sciences, Bouazza (1989) reports on an early study (Bernard and associates, 1964) in which older scientists used the literature for the purpose of choosing research topics, while younger scientists leaned on informal discussions. In the humanities, two studies (Basker, 1989 and Sievert and Sievert, 1989, as cited in Watson-Boone, 1994), both with philosophers, identified that a great part of scholars went to colleagues, rather than to the library, for information when starting a new research topic. Wiberley and Jones (1989) observed that their scholars used formal bibliographies limited to one or two sources only intensively when exploring new topics. In the case of music scholars (Brown, 2002), ideas for research projects seem to come from four main sources: previous work, commissions or calls for papers from scholarly associations, discussions with colleagues, and reading literature or sources in the area.

The way in which research topics (or questions) originate among the film and media scholars in the studied case ("personal fascinations", framed within broader projects/interests, or from the need to understand specific archival collections) may have an impact on the duration of the initial **research stages**, in which the scholar must scope and narrow down a topic and come up with more precise approaches[138](p11-cd).

Since "information needs [are] no more studied as ends in themselves but rather as embedded in the actions they support" (Ingwersen & Järvelin, 2005), this section concludes with a proposal for grouping the different research topics into research focuses, which are based on the research perspectives' classification found in the literature (§1.5). These proposed "research focuses" are defined next.

7.6.1.1.Research focuses and their objects of study

This section structures the findings in the context of the first research question by looking at the identified research topics[139] in relation to more general **research areas**.

Indeed, film and media theory shows that even though film scholars share the same objects of study, there are different ways to approach them (§1.5). Actually, Kessler & Lenk (2014) have seen "film" as a sort of "chameleon", that "takes the color of the social context in which

[138] Even though scholars were asked to explain their research process, which was used to observe information needs and sources, research stages were not systematically studied here. From 2002 to 2012 this is a more common topic of IB literature. Indeed, even though Ellis and his colleagues insisted on that the behaviors they saw among social scientists did not occur in a strict sequence (Case, 2007, p. 261), there is current active work about research stages. For instance (Bron, 2013; Bron, Gorp, & de Rijke, 2015) explored this issue by investigating a group of twenty-seven media studies researchers. The authors found common stages in their research process with other humanities scholars (literary critics and music scholars), the first one including the initial idea, background study, developing the initial research questions, and an initial information gathering.

[139] In addition to introducing their broad research topic or area (as listed in the beginning of this section), the participants also were asked to choose one of their recent or current research topics, to be used as the center of the interview discussion. These latter topics constitute the final sample that was used for the analysis reported from here.

it is placed, adapting itself to the questions that are posed at different levels: commercial, cultural, entertainment, documental, industrial, pedagogical, etc."[140] In other words, film would act as a kind of "boundary object" for different researchers[141]. The term "boundary object" was proposed by (Starr & Griesemer's (1989) as cited in Bowker & Star, 2000) to refer to "those objects that both inhabit several communities of practice *and* satisfy the informational requirements of each of them." The authors continue explaining: "In working practice, they are objects that are able both to travel across borders and maintain some sort of constant identity."

Using a bottom-up approach, which corresponds to this thesis' qualitative, grounded theory methodology (described in §7.5, and in Chapter 4), it was possible to find evidence of the "new film history" perspective in the scholars' topics (e.g., research about cinema-going, and an intense use of primary sources) as well as a variety of perspectives within that approach[142].

However, since the interest of this study is not historiographic or epistemological, but behavioral from an IB point of view, a more appropriate grouping of their topics seems to be by "research focuses", rather than by knowledge areas or theoretical research perspectives. The word "focus" actually refers, instead of to epistemological classifications, to more flexible approaches (or points of attention) that may be assumed, even by the same scholar, over time or depending on the research or teaching tasks (the "chameleonic" changes termed by Kessler and Lenk) .

With this practical intention of explaining possible patterns in the (information) needs, metadata, or search strategies or systems that are used by the different scholars in relation to their different areas of specialization, their current research topics are grouped into four categories, called "focuses" from now on: (1) aesthetic/narratological focus; (2) cultural/documental focus; (3) social media history focus; and (4) epistemological focus. Additionally, there is evidence of the existence of an emerging research focus, which is called (5) data-driven focus. This perspective was detected during a parallel study conducted in the course of this thesis research (§4.4)[143].

Although these categories are not mutually exclusive, this grouping proved to be effective to explain the media scholars' information behavior, tied to their research tasks, which will be explained after a definition of each research perspective.

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[140] Original text in French, translation by the author of this thesis: "Nous allons nous concentrer par la suite principalement sur le film, sorte de caméléon qui prend en quelque sorte la « couleur » du contexte social dans lequel il est placé, c'est-à-dire qu'il s'adapte aux questions que l'on pose, que cela soit au niveau commercial, culturel, distractif, documentaire, industriel, pédagogique, etc." (Kessler & Lenk, 2014)

[141] Megan Winget (2008) also borrowed this concept in her study about musicians, understanding them as artifacts, documents, or ideas that help people from different communities build a shared understanding.

[142] The concept of "new film history" was briefly described in the overview to film and media studies presented in the introductory chapter (§1.5).

[143] Also, during the activities in which I participated during the internship at Utrecht University, I witnessed the growing interest that data-driven research tools for the humanities brought to film scholarship. In addition, there is additional evidence from the "extra" study performed during this research (§4.4), where two of the scholars who participanted in the interviews were the same. For this reason, this perspective is included here as part of this study's findings, although the information needs and seeking behavior of this group is not explored in detail.

7.6.1.2.Aesthetic/narratological focus

Apparently, this focus coincides with the "aesthetic approach" that has predominated throughout film history. The avenues among the interviewed scholars may certainly differ from those studies in the "old history" tradition[144], but the focus remains on the individual film works.

Undeniably, the objects of study for several scholars in their investigations are the individual media (i.e., movies, television programs, or other media as works, in what makes them aesthetic or industrial products). In current trends, these media may or not be part of the canon, but they are (still) studied as texts (Chapman, Glancy, & Harper, 2009, p. 3). This research focus could be compared to that of art historians or iconographers, studied for instance by Brilliant (1988).

In the group of participants, there were several scholars with research questions within this focus. Their topics included:

- A specific movie (e.g., intertitles in "Intolerance" by D.W. Griffith, 1916);
- A group of films depending on genre or style (e.g., city symphonies, and German crime television movies between the late 50's to the late 60's; Video culture: historical traditions in first person videos, from early expressions of video cultures in late 1960's to early 70's, to current times);
- General "motifs" (e.g., comic depictions of boxing$_{(p1\text{-}a)}$, or narrative "motifs" (e.g., telephone and last-minute rescues in films$_{(p1\text{-}a)}$; and
- Themes (e.g., apocalypses in films$_{(p5\text{-}a)}$).

Focusing on film directors and artistic styles is also common within this research focus (as evidenced in participants from Study B (Chapter 6).

7.6.1.3.Cultural/documental focus

Scholars with a cultural or documental focus look at film and/or other media as documents which are informative of historical, psychological, or social realities. Films are not seen only as "text" as in the aesthetic/narratological focus, but (or also) as documents sources of information or evidence. In the group of this study's participants, there were few scholars with research questions within this focus. Their topics included:

[144] Chapman, Glancy, & Harper (2009) explain that this approach is exemplified by pioneering film histories such as Terry Ramsaye's "A Million and One Nights" (1926), and in recent publications such as David Cook's "A History of Narrative Film" (1990). This perspective is partially related to the concept of "auteur theory" and "genre theory". The first one is an attempt to explain how film works as an art form, based on the Renaissance idea that an individual, usually a gifted artist, is the source of meaning and value in artistic texts (Casey B. & Mortimer, 2013, p. 20). The assumptions of this theory were challenged by the "genre theory" in the 1980's, which was an attempt to approach the study of film in a more systematic, classificatory way (Casey B. & Mortimer, 2013, p. 23;42). In the "old history" tradition, as Chapman et al. explain, this approach is criticized for a narrow view on film history, and a higher attention to the canon.

- Images of 'Dutchness'. The Emergence of Modern Popular Imagery and Representations; and
- Color in the 1920s[145].

Additionally, related to what Kuhn & Westwell (2014c) call the "sociological perspective" (described in §1.5), studies on national cinemas could be another line of interest that corresponds to this cultural/documental research focus[146]. It was observed in the topics from participants in Study B, which included: the study of European, Spanish and Latin American cinema or television and their history (according to different periods or events, e.g., the Spanish civil war); the issue of representation of Spanish cultural identity throughout film history; the cinemas of the Maghreb; and Iranian cinema.

In this cultural/documental focus, research questions may originate from other domains (not necessarily within film studies). Indeed, it is common that researchers in this perspective are in a borderline with other disciplines and have to face cross and **inter-disciplinary studies** (e.g., with Gender studies $_{(SB,p3)}$ or with Medical humanities$_{(p10\text{-}cd)}$. This focus (together with the "social media history" focus), may relate to area studies* or cultural studies* perspectives, in which films and media constitute potential areas of inquiry, in what could be seen as a quasi-instrumental view of cinema.[147]

This focus is clearly exemplified by the use of moving images by historians, who are increasingly interested in the relationship and use of films in their discipline (Toplin & Eudy, 2002). John E. O'Connor, creator of the journal "Film & History", proposed four ways in which historians could examine films. Toplin & Eudy (2002, p. 7) summarize them as follows:

(1). First, moving image could be studied as a "representation of History" (how the events are portrayed, how the past is interpreted and how history is treated in movies).
(2). Secondly, film could be seen as "evidence for social and cultural history" (the stories presented in movies sometimes revealed the "values" of the filmmakers and the concerns of society at the time of production).
(3). Thirdly, "actuality footage" could be used as "evidence for history" (material from film and television serves as the best evidence available for the study of specific historical events)
(4). Finally, O'Connor suggested that there could be investigations about "the history of

[145] "An investigation about the cultural, scientific, philosophical and educational significance of color in that decade" (University of Bristol, 2012).
[146] Although in Study B scholars were not requested to select a specific topic to discuss during the interview, they could explain briefly their research interests. Although some scholars' topics coincided with those of scholars in Study C, few of them did not. That set coincidentally corresponded to this sociological focus.
[147] The word "instrumental" is used here to refer to this idea of "using" film for secondary purposes than the original purposes for which the film or media work was made for. For instance, as Casey B. & Mortimer (2013, p. 16) explain, when movies are used in the curriculum, usually as a carrier for something else: "this might be to illustrate historical events, show an adaptation of a Shakespeare play, as an aid to the study of foreign languages, or in its traditional, educational documentary role". Interestingly, there are also "instrumental" way of making films, for instance, in what is called "militant cinema" (e.g., Robert Greenwald, a filmmaker and political activist, considered a movie not as an object in itself, but as a point of departure for debate and political action (Brisset, 2011, p. 32).

the moving image as industry and art form".

Even though O'Connor was referring only to movies, his perspectives could be applied to describe better research topics and questions within a cultural/documental research focus:

(1). The first approach, moving images as representation of history, may correspond to the topics found in the group of Spanish film scholars, the "sociological perspective", in which research questions relate to the history of film in a given country and/or period[148]. At another level (non-history oriented), this perspective could also cover topics that look into other types of realities and how they are "represented"[149].

(2). The second approach proposed by O'Connor, of film as evidence for social and cultural history, is exemplified by the two participants' topics identified in this section: Images of 'Dutchness', and color in the 1920's.

(3). The third approach suggested by O'Connor's, of actuality footage as evidence for history, is evidenced in a study from one participant who, although was not part of the interviewed scholars for Study C, was an active member of the film seminars that took place in the department where this study was carried out. One of her/his interests was to look at how portable radios offer depictions of modernization of the Dutch society between 1950 and 1970. This specific question is part of a bigger research that looks at the role of the United States in the appropriation of media in the Netherlands (1890-1990), for which different media have been taken as case studies. This researcher is indeed a historian, looking for "footage" as evidence of history[150].

(4). Finally, the fourth O'Connor's suggestion actually corresponds to the "social media history" focus that will be described next.

[148] Concerns about the relationship between film/media and reality fall into this approach: "However, the frequently asked, eternally vexed, and fundamentally sociological question of the relationship between themes and images in films on the one hand and wider social structures on the other continues to trouble film studies. How might the film/society relationship be conceptualized, and what methods can be used in researching it? Meanwhile the chief, if largely unacknowledged, legacies of sociology in the discipline of film studies remain ideological criticism and genre criticism." (Kuhn & Westwell, 2014f)

[149] For example, a scholar from Study B who specializes in gender representation in film and media defined her/himself as "identity researcher" and not as a film scholar: "I don't consider myself a film scholar, in the sense that I study movies as a way of exploring a topic (homosexuality)" (SB,p3). This sort of thematic approach may overlap with one of the approaches in the aesthetic/narratological focus (e.g., "apocalypses in films"), however, even though the question is intertwined with other domains' inquires (in this case Religion studies), in the aesthetic/narratological focus interpretations are undertaken mostly from the perspective of film theory, film genre and cinematic narratives, as it was evidenced in one of the publications by this study's participant. In this case, no other medium, but the movies, could tell how the apocalypse has been represented in films. On the contrary, within the cultural/documental focus, not only "movies", but also other media (or a combination of media) are needed to provide an answer to the questions. In this sense, the aesthetic/narratological approach still differs from the cultural/documental approach.

[150] Seeking for stock footage* is also the task of the "film researcher" (see also §7.4.4). This profession is also related to other "secondary exploitation" uses of film footage. Inskip et al. (2008) investigated the secondary exploitation of music in movies. They defined this as "encouraging the use of material in films, commercials and on radio and television as well as in clubs, internet and live". There are several ways of "exploiting" moving images for performance or commercial purposes (for example "VJing" (Ustarroz, 2013)). This type of use is associated with the culture of remix, which will was briefly discussed in §7.4.4.

7.6.1.4.Social media history focus

Researchers with a social media history focus look at the circulation of media (films, television programs, etc.) in society, at their social history within them or in a broader context(p8-h). The research topics with this focus among the study participants include:

- Film exhibition and consumption in the Netherlands in the post-World War II;
- Transnational television in a transnational media event (Eichmann case);
- Impact of cinema in rural and small towns' life in the Netherlands (Post-war period); and
- Cinema-going in Colonial Indonesia, 1895-1918.

Research questions with this focus are often related to the history of film exhibition, film consumption, audiences and reception history, the social history of the media, cinema-going, buildings, and audiences in a historical context. The focus is on people's experience with the media (as a social phenomenon) as opposed to the focus on the aesthetic experience caused by the inherent characteristics of a specific source (aesthetic/narratological focus). Scholars in this area may not call themselves "film scholars", but rather media historians or social historians specialized in media history (depending on the background)(p8-h). Higher attention to contexts of production and reception is one of the main characteristics of the so-called "new film history" (Kuhn & Westwell, 2014e) or "New cinema history" approach(p8-h). One scholar comments that at the university where this study took place this perspective came into play approximately ten years ago, and although it is not common yet to do this kind of research, it is starting to be so(p8-h).

One film scholar's research questions are for instance related to cinema going as a social experience: "Which is the impact that the arrival of the cinema had on Jewish immigrant life in New York City?" or "How in the post-war period from 1945 onwards cinema made a big boom in rural and small towns' communities in the Netherlands?"(p8-h)401z. The focus moves from the film or media as works, or from their content or representational aspects, to their reception in a broader historical context, also in relation to other cultural manifestations in a broader social and leisure context (e.g., theater or dance). A television scholar who has the topic of "transnational television in a transnational media event (Eichmann case), explains:

> "It is about the trial of Adolf Eichmann which took place in 1961 in Israel. I am not interested in the trial itself, and I am certainly not interested in Eichmann, but mostly in how the trial was used to produce a global media event, or let's say a transnational media event, so I am mostly in the technological and institutional preconditions that made that possible. So it is about institutions and technology and cooperation"(p4-h).

Kirkegaard and Borlund's (2008) investigation of the needs of media studies students and scholars also identified these factors in one of the so-called dimension of their needs. It was termed "the transmission dimension", described as a "concern with a need to be informed about each broadcast's originally transmitted context" (p.118). Additionally, these authors

identified another dimension which characterize the needs of media scholarship: the so-called "audience dimension", which consists of the need for information about the audiences' reception of the broadcasts, and thus for ratings information (p.119). It is not a coincidence that in Kirkegaard and Borlund's study two of the three most important information needs for media and communication scholars fall within the social media history focus proposed here, since the interests of audiences and reception characterizes that discipline (§7.3.3).

In the case of early cinema, novice researchers may be originally interested in the films, but their focus has to move towards other media and to the historical research focus because of the characteristics of the investigated period, from which many films have disappeared(p13-h;p11-cd).

Even though in the previous research focuses films or media are rarely isolated from their production context (that is what the "new film history" perspective is about), the differences between the social media history focus and the previous ones are to be found in the degree of interest in what the films themselves tell about historical realities (the sociological perspective, and the cultural/documental focus), and the actual historical reality in which they were produced.

In relation to the "**sociological perspective**" described before, at least from what can be deducted from the Spanish group in study B, the interest on data about cinema-going or audience research is not that common. However, these scholars have several common information needs with the social media historians: they do need contextual historical information intensively, and they use a variety of sources, as it will be discussed later (§7.6.3).

7.6.1.5.Epistemological focus

Scholars with an epistemological focus are interested in media phenomena at a meta-reflective level(e.g.,p2-e). Even though philosophical attitudes are common among film and media researchers independently of their focus, in this case, the more abstract, epistemological or macro-level considerations about the media and related disciplines become research questions themselves.

One representative example is the question that motivated one researcher to pursue an investigation about communication technologies: "why people invest some much time, energies and money in new technologies in order to improve things? […] How the public culture discourse and the industry discourse influence each other [in painting] these pretty pictures of the future of communication?(p8-h). Other topics of study by the interviewed scholars, which exemplify this focus, are:

- Augmented reality as an archival laboratory; and
- Media archeology analyses of (wireless) communication technologies, social media and augmented reality.

In the first case, the scholar conceptually investigates the use of interfaces by film archives – for instance, augmented reality for presenting archival materials, seen as moments of experimentation(p2-e). The scholar may be familiar with many different information systems (and prototypes), but (s)he is not interested in the actual testing or detailed study of each particular case(p2-e).

Scholars with this focus may also reflect about **film archives** and their role in relation to film history writing(p1-a;p10-cd). In addition, they may reflect on their selection policies and their impact on what films circulate, how the canon evolves and how the "archival mechanism" works(p14-a;p10-cd;p7-e), as opposed to, for instance, distribution platforms such as YouTube(p6-a). The very logic of selection and "curation" that applies to certain online collections is intriguing for these scholars, for instance, one of them asks her/himself: why certain materials are included, and others left out? Is it always the same names that keep coming out (in research, in mainstream databases), what is the difference of their approach with social platforms? What is the role of dominant institutions (e.g., MOMA) in building the canon?(p6-a). Scholars may reflect about archives as one of the many filters (conceived as logics and paradigms) placed around films (e.g., epistemological filters, technological filters)(p2-e). In sum, researchers with this focus are interested in film historiography (as described in §7.3.3).

Other topics mentioned by the participants include: **ethics of access** and the role of the archive in releasing certain collections in an open and uncontrolled manner (e.g., the case of medical images)(p10-cd;p14-a); and semiotic concepts that are relevant to information studies, such as "**indexicality**", the theoretical notion of the index(p2-e), or the ethical or philosophical implications of **classification**(p10-cd), or even the epistemological impossibility of categorizing and classifying as a way of knowing that is brought about by information overload(p7-e).

After having described the main research focuses identified in the literature, supported by evidence from the studied group of scholars, the next section explains, based on these focuses, the findings about the sources for research, their selection and analysis.

7.6.1.6.Integrative and data-driven focus

A new tendency and emergent perspective in film scholarship is to try to bridge the gap between the aesthetic/narratological focus and the social media history focus, and also to connect these areas with a cultural/documental focus.

This was the goal of the previously mentioned project conducted by the University of Amsterdam and The Netherlands Film Museum (EYE) among others (§7.6.1.1). The project intended to facilitate answering questions at a historical level but also about the content and aesthetics of the films themselves. The interest on film and media is both in the text and the context. Their challenge is to see how to connect both, for instance, by linking data about distribution and exhibition networks of the films and the patterns in the films' aesthetical composition (see for instance, Masson & Olesen, 2015).

This focus is not exclusive to a group of scholars, but rather part of a tendency to explore new connections enabled by data analyzes, and usually framed in broader research projects. As one of the project leaders explain, this integrative view is part of the research on creative industries (e.g., about the emergence of cinema in Amsterdam). This area investigates the social and economic networks around media and the histories around them: for instance, by looking at which persons were involved, how they were related (personal relations, business relations, etc.), if there is collaboration across the sectors.

Equally, some researchers clearly framed within a given focus (e.g., aesthetic) may use a data-driven approach and techniques applied either to content-based features of the media (for example, as scholar Lev Manovich §2.4.3), or to document analyses about the evolution of film/aesthetic concepts. This later case is the approach of a young researcher, who is tracking the evolution of the "city symphony" genre through quantitative textual analyzes of words in titles, indexes, and other scholarly sources.

7.6.2. Types of sources, their selection, and analysis methods

This section presents the findings of this study's second research question (*RQ3.2*) about the kinds of sources which are used by film and media scholars and the most significant characteristics of their methods for collecting and analyzing them, by using the proposed research focuses described above.

7.6.2.1.Primary and secondary sources

One important publication about the IB of art historians indicates that "The art historian's major source of information is, by definition, the art object itself." (Stam, 1984). However, even though a priori this conclusion may also seem applicable to film and media scholars, this is not the case. Arguably, it is not applicable because the individual media works are not the primary source* for all types of this group of scholars, but also because in addition (or as a supplement) to the moving images there is a wide variety of sources being used. Also Stone (1982) found that the literature tries to emphasize the diversity of source materials* that humanists require, including primary sources such as original scores, works of art, texts, manuscripts, recordings, original literary works, technical records, site records, maps, among others.

In the **aesthetic/narratological focus,** the main primary sources are the moving images (often movies or specific television programs). There is also interest in film-related materials* as primary sources of information about the selected media$_{(p1\text{-}a)}$. These materials are varied, and include graphic sources (e.g., postcards, press books, posters, film stills or production photographs), moving image promotion materials, such as promos or trailers, just to mention a few[151], and materials produced before or along film shooting (drawings, scripts, etc.).

[151] See Gray (2010) for a comprehensive view on the topic.

Secondary sources*, mostly of textual nature, play a fundamental role in the seeking process, as it will be described later (§7.6.4). For scholars with a focus on film history, relted materials* (e.g., a theater program) also provide clues for the identification details of individual films (for instance, if a title is displayed in a bigger font).

Scholars with a **cultural/documental focus** consider films as just one of the many other possible media that can be used as primary sources. In this focus, films are not isolated from other media, and media, all together, act as a historical or documental source. This combination of sources evident, for instance, in the case of a scholar researching on medical images, for which (s)he uses photos (produced as part of the scientific work) or chrono-photography slides(p10-cd), or for the scholar researching on color in films, who use a wide variety of sources coming from art, architecture, design, and performance[152]. This use of several media corresponds to an "intermediality"(p10-cd) perspective, which indicates that different media "depend on and refer to each other, both explicitly and implicitly […] interacting as elements of particular communicative strategies […and as part] of a wider cultural environment" (Jensen, 2008).

An additional example that shows the variety of sources that are used in research with a **cultural/documental** focus is the investigation by one participant on the role of images in the production of what she calls "supposed common knowledge" about the Netherlands and the Dutch in the long nineteenth century (1800-1914) in the western world. The researcher is interested in observing how visual media (predecessors of early cinema) reflect the development of national clichés. This scholar identifies a great variety of **visual media** in which to find answers to the research questions: tourist brochures, postcards, magazines, films, advertisements, lantern slides, advertisement trade cards(p11-cd).

In turn, moving images are not the primary sources for researchers with a **social media history focus**. Instead, they are interested in any other source that provides contextual and historical information(p13-h) about the media works:

> "I confirmed that the films were not so important, but the context and historical information around them. […] the films are important, and I want to know of course what they [people] were seeing, what was made, but I am not doing analysis of the films, in that sense it doesn't matter so much that they [the films] don't exist."(p13-h).

Consequently, for scholars with a social media history perspective the primary sources are those that are suitable to extract data related to the contexts in which films were made, how they circulated and the reception they had:

> "Interviewer: do you use films as primary sources? Participant: Hardly. I do almost everything that you can think of, but not on the films themselves: **demographics**,

[152] The project page states: "Taking cinema as the galvanizing focus, the project will also examine colour's intermedial role in other arts—including commercial and print culture; fashion and industry; theatre and the performing arts—in order to produce a fully comprehensive, comparative and interdisciplinary study of the impact of colour during a decade of profound social, economic and cultural change." (University of Bristol, 2012)

> **newspapers**, all kinds of **periodicals**, **building maps**, **city directories**, whatever you can find in municipal archives […] and we do take a look at film programming, to the kind of profiles that specific cinemas have, the audiences they target and the genres you can discern in their **programs**"(p2-e).

This is clearly illustrated by the case of one researcher who was interested in the films produced in one region at a specific time (1910), finding that the first available movie at the archive was from 1912. Faced with this challenge, the scholar visited the country's newspaper archive in order to reconstruct from the news which films may had existed and/or which were their distribution and exhibition details(p13-h). Indeed, one of the main primary sources for the **social media history focus** is newspapers. Additionally, this group of scholars is closer to (or may even be) historians, and in consequence need intensive archival research. They also are often more interested in the paper archives than in the moving image archive itself(p8-h). In combination with all sorts of mentioned non-visual sources, as mentioned in the previous quote, the programs of certain exhibitors, or of a broadcasters also are of importance, for example for a television scholar(p4-h). All these sources provide data for the historical research; one scholar suggested to start collecting oral histories as primary data as well(p8-h). If the films are accessible, the social media historian may still watch those filmed on location (with a documentary intention to observe buildings and the neighborhoods), and this also applies to photos, which are useful in case they exist(p8-h). Additionally, secondary sources are relevant, in the sense of what is written already about the topic (e.g., the period under investigation). If the topic is not explored yet by the scholar, then literature about the historical period comes next in the priorities(p8-h).

Determining which types of sources are needed for a researcher with an **epistemological focus** is more complicated than in the previous cases. The variety of sources that researchers with questions in this perspective need is wider than in the other cases. One participant commented (s)he uses movies, trailers, television shows, popular online journals and magazines, conference proceedings and even interviews key informants in her/his area(p7-e).

7.6.2.2.Source selection

Selecting the primary sources for research is related to the process of building a corpus. Primary source selection for the purpose of research is rarely exhaustive. That is, in general, film and media scholars may prefer to find few but representative cases for their research topic, rather than all existing sources about it (e.g., not all released movies, but a selection based on significance,(p5-a). If, for different reasons the scholar attempts to be exhaustive, the corpus (and thus the research topic) assumes very specific forms, e.g., "German crime television movies from late 50's to late 60's."

For scholars with an **aesthetic/narratological focus**, building a corpus may represent several challenges, such as film identification and access. Additionally, the scholar needs to develop seeking strategies (not always consciously) to find their way and later justify their

selections(p5-a). There is a higher level of difficulty if the scholar intends to include films that are neglected by the canon(p14-a). In the case of having to build a corpus based on online media (e.g., YouTube videos), the scholar may face problems both for ordered selection, as well as for stability or permanence of the corpus, which on these social sites becomes volatile, in constant transformation. In those cases, the scholar needs to reflect more intensively on the method, and may go into epistemological dilemmas (epistemological perspective), but there is an awareness that being comprehensive is not possible(p6-a;p7-e):

> "There is so much material produced nowadays, it would be almost illogical for a scholar to approach that material as if it is an archive with boundaries that you could capture, and use this to analyze or present that culture. What present culture is about is that the avalanche of audiovisual material that is produced starts to become uncapturable, in a modern sense. By modern I mean that you could categorize it, select it, put boundaries to it."(p7-e)

In these cases, the scholar experiences feelings of frustration, getting lost, missing something, and being overwhelmed(p6-a). Exhaustiveness may only be possible in the case of very short (and accessible) films, as for instance in early cinema research(p1-a), where they are from 1 to 6 minute long (from 1895 to about 1910)(p9-a). Secondary sources, which present reviews or critics about the primary sources (the moving images), are essential to this process, as it will be discussed in the next section (§7.6.4.1).

Building a corpus is also essential for scholars with a **cultural/documental focus**. This may certainly represent bigger challenges than in an aesthetic/narratological focus since selection is not necessarily based on individual works. In the case of having to select media of different kinds (e.g., visual materials) the scholar may face the feeling of getting lost in the material and difficulties to assess what is relevant to include(p11-cd). What seems to prevail in these cases of selection problems is the need to rely on colleagues and the research community(p11-cd), but there is self-awareness that the selection has to stop at a certain point(p11-cd), or simply that being exhaustive is not necessary: "since I don't have a quantitative approach, losing one set is not so problematic"(p11-cd).

Building a corpus for scholars with a **social media history focus** is different than for the other research focuses, since it is not based on media works but on data about events framed within specific historical periods or locations. Source selection (mainly for data extraction) is not exhaustive or comprehensive either, but it may be done more systematically than i2n the other research focuses. Personal criteria, intuition or instinct in selecting the most relevant sources still predominates since the researcher has to be "inventive" in determining where to obtain certain data and how to put the pieces together(p8-h).

Because of the challenges brought about by transformations in document structures and new media sources, scholars with an **epistemological focus** may select their corpora based on different notions than that of the individual film or media, for example the concept of "project", as one scholar explains:

> "we are used to talking about "films" or "corpus, "the body of films," "collections", but what is a project? […] it is like the database for a museum, but a project is a singular interface [they became] temporary interfaces to the collection, because every time a museum or archive gets subsidy to develop a new game or app, it is reinvented […] every project has a newly invented interface"(p2-e).

However, the research methods of scholars with an **epistemological focus** do not seek exhaustiveness or comprehensive views either (e.g., there is no need to build a corpus or exhaustively analyze all movies that could exemplify a certain behavior, but to find exemplary scenes and do an in-depth exploration of them). What seems to prevail in these cases of selection problems is the need to trust their intuition(p7-e). Indeed, when asked about selection criteria, the participant may indicate having a sense on which sources were relevant for her/his topic(p7-e). For example, one scholar who is researching about mobile communication technologies in popular culture, explains:

> "Sometimes you know that in order to assess if the movie (or tv series or documentary) is useful or not, you have to see it [but] I would not be interested in amazing a lot of movies to argue on a certain point that I want to make, it is good to have a lot of examples, but my research project is not so much about the assessment of public culture itself, thus a textual analysis of 5 or 10 movies [is enough], because I am more interested in explaining certain scenes"(p7-e).

Finally, in relation to **genre preferences**, it may be more common in the aesthetic/narratological focus to look at fiction films than in the cultural/documental focus. Although evidence was not found about genre preference in the case of researchers with a cultural/documental focus, in certain cases fictional movies may bring challenges to the researcher seeking to document a historical event. For instance, a fictional film in which the experience of going to the movies is shown as part of the story may not be as reliable as a photograph of the same event. When the fictional source is used for drawing conclusions, the scholar has to check for validation of the historical phenomenon(p13-h).

7.6.2.3.Source analysis

As it was suggested in Chapter 3, information use is an area of IB studies which is not so extensively studied as IS&R. Even though this study did not focus on information use as such, or on information annotation, some of the findings of analysis methods emerged from the participants' descriptions of their research processes, as follows:

The main finding agrees with previous studies about humanities scholars, since no quantitative approaches are followed, no generalizations, but interpretations are sought during the analysis processes. Next, some of the main characteristics of the scholars' information use and information annotation behavior according to the identified focuses are suggested:

Within the **aesthetic/narratological research focus** it is common to see scholars engaging in

"close readings"[153] of their sources, which on a practical level may be done through performing formal examination of their primary sources (films as texts), such as shot-by-shot or sequence analysis (§7.5.2a). This characteristic also was found by Kirkegaard and Borlun's (2008) study of Media studies students and scholars, that use television broadcasts as objects of analysis, confirming previous observations by Auffret and Prié (1999): "Scholars perform on documents what we call an active reading, as opposed to the traditional passive reading done when reading a novel for leisure or when watching TV" (Aufreet and Prié, 1999, p.319).

Formal analyses may be done to look for clues to a given interpretation of the text: "your interpretation is in the text itself, your approach to the object is based on intuition in great part […] I work with certain assumptions or claims which I try to argument. I look for strength in my argument; the close analysis is done to support that"$_{(p5\text{-}a)}$.This form of analysis, especially for scholars with an aesthetic/narratological focus, requires intensive viewing: "I watch the movies 20 to 30 times to break down the sequences"$_{(p5\text{-}a)}$. Some scholars also perform metrics analysis, through manual systematic comparisons between different editions of a single film$_{(p12\text{-}a)}$, or in semi-automatic ways using systems such as "Cinemetrics"$_{(p14\text{-}a)}$ – which was described in Chapter 2 (§2.8).

Formal analysis is often only performed for selected sources and sequences within them. This selection corresponds to what the scholar is interested, with a specific question in mind$_{(p7\text{-}e)}$. Also, formal analysis is frequently combined with historical analysis. One scholar describes two analysis levels that are common in this perspective:

> "The first one is to look closely into the material, how something is made, how the camera is used as an instrument of aesthetic exploration of the things that are before the camera, the fundamental cinematographic poses, how it is incorporated into a story, the foundation of a narration, [what it means in terms of] cinematography, dealing with the material as material and as a narration. The next step is to set it into a history time frame, all the historical research around the material is important at this stage, when I go far from the material itself"$_{(p9\text{-}a)}$.

The participant of the previous quote adds that when (s)he watches the material for a first, second, or third time, all this levels of analysis come together (meaning the combination of formal and historical information):

> "Since I have a good historic background I can put them as a piece of a puzzle in a broader context […] when you do formal analysis and historical analysis for so many years, they come together as a bundle […] then you start to divide it and give it structure when you write"$_{(p9\text{-}a)}$.

Film and media scholars regardless of their research focus are trained and capable of performing formal analyses, and may use it depending on their work$_{(p1\text{-}a)}$, but scholars with an aesthetic/narratological focus use it more often. Experts on doing the formal analysis are

[153] The term "close reading" is used as opposed to the term "distant reading", coined by literary critic Franco Moreti in 2000 (Moretti, 2000), is currently used to refer to a way of "understanding literature not by studying particular texts, but by aggregating and analyzing massive amounts of data" (Schulz, 2011).

seen by their colleagues as "film philologist"(SB,p6) (see §6.7.2.1. for more details on close analysis as an annotation a form).

Even though for the purposes of defining the main information behavior characteristics scholars with an **aesthetic/narratological focus** were defined as those who are focused on specific media works, there are differences in the degree to which formal analysis is used by the scholars in this group, which certainly varies according to traditions within disciplines, or to the amount of sources that are being analyzed. The main difference in the analysis procedures was identified between film scholars and television scholars. For instance, one film scholar commented about television scholars:

> "I have worked with television scholars, most of them have a different approach, methodology, look at it differently [we share the object], but I would look from a fairly traditional close analysis point of view, but they look at it in terms of discourse analysis or production analysis, I am not trained in that way [even though I know and teach the methods]."(p5-a)

For television scholars, formal analysis is performed as a subsidiary form of analysis to other methods, for instance, as suggested in the previous quote, to discourse analysis. However, recent views, as suggested by this interviewee, point to the need to return to stylistic or formal analysis of television productions, also in relation to website and platforms, besides or as a complement to historical, analytical or descriptive studies that are more common to questions in this area about history, reception, institutions, economy and industry; one of the authors proposing this switch is Jeremy G. Butler in his book "Television style"(p6-a). The following quotes are from a television scholar who explains her/his current analysis process:

> "I work within a framework that could be described as a combination of discourse and textual analysis. I analyze [the moving images] themselves, but not only that, I look at the formal and content characteristics inscribed in the [sources], but also to their distribution, production, historical and socio-political context. My sources all look similar but depending on the context, the meaning changes. I use categories, […], definitively a qualitative methodology. I don't work with audience research or ethnography."(p6-a)

This scholars researching on historical traditions in first person videos continues:

> "On a textual level, I start with a very classical approach, looking at formal characteristics (the video format, analog, digital…, framing, colors, sounds, technologies used to record the sound, editing). From there I try to place in the bigger motifs (context in which these videos come to exist, politically, culturally), what existing research tells I need to find out". I use triangulation to link a specific position on the subject in the video to technology, distribution, researching practices and audience (for whom is it produced), I also look at participation around the videos (in YouTube) but cannot count much in the numbers(p6-a).

In that sense, from the perspective of the analysis methods, television scholars are closer to researchers with a **cultural/documental focus**, since form and composition are used to support a broader analysis of the content and context of the moving images. Scholars with a **cultural/documental focus** do not usually perform a deep analysis of image composition from

the beginning, but look at recurring motifs in relation to each medium specificity or to overarching themes(p11-cd;p6-a).

For instance, one scholar working on medical images (cultural/documental focus) was asked by a group of psychologists what could (s)he bring from her discipline (film and media studies) to their discipline; the scholar answered that it would be the knowledge about the images, how they function, how they were made, and the technological factors that could influence the meaning and the context in which they were produced and used: "an important way of looking at the images for me is how they are used, how they are embedded, presented in relation to other images"(p10-cd). The researcher may not be exclusively interested in the images themselves (as it occurs in the aesthetic/narratological perspective), but in the contexts in which they are produced or received (in this case, informative elements in the images, such as captions, comments, intertitles, may support the researcher in understanding how the images are presented to the public and, in that sense, reflect what people say to see in them); it is this relationship what creates meaning(p11-cd).

As it is observed from the previous descriptions, scholars with either an aesthetical/narratological or cultural/documental focus, also look at historical or contextual information about the moving images during or as part of their analysis (according to the "new film history" perspective described in §1.5), but the historical context is not (yet) in itself the center of the investigation, as it occurs in a social media history focus. Scholars with a **social media history focus** may not have a single (not even definable) method of analysis, although as one scholar comments, they are supported by "hermeneutics" in a certain way(p8-h). However, it is common to encounter "historical analysis", which requires organizing the sources, making connections and teasing out meanings"(p13-h). In a later study (Chapter 8) a tendency towards data extraction and analysis of that data is identified. Automatic existing tools may be used to support that task, but not as means to themselves, as one scholar in this study critically explains:

> "I could use statistical programs and see how many words are being used, and a combination of words [...] you can expend a lot of time on that, it can bring interesting things but this is not all. I always say to my students that I use my brain"(p8-h).

The participant from the previous quote similarly comments that once you have a question, there are many different ways to answer it, but at the end what counts is having a good story to tell, which has to be convincing and based on the primary materials, "a story that is possible", (s)he adds(p8-h). The participant goes into details and elaborates on this idea:

> "I am systematic with my searches. I am pretty bottom-up, I don't have a big theoretical argument which I just illustrate. Of course you have an idea somehow, you have to make sure to have a pre-conceived framework, but if your sources tell you something different, you have to change and cope up with that. Some people take just what is out there to support their argument. That is very bad history; you have to cope with contradictions [...] or sometimes you just don't know. It is an open-ended thing. I sometimes have to correct myself, even years later and looking

> at the same material, when you read something, and you realize I overlooked this! Then you search for more things"(p8-h).

As in the case of the scholars with an aesthetic/narratological or cultural/documental focus, for whom the amount of media sources that are analyzed varies, the same occurs to scholars with a **social media history focus**. As it will be observed in Chapter 8, the unit of analysis can be a specific period and place (e.g., cinema going in the post-war period from 1945 onwards in rural and small towns' communities in the Netherlands), or a specific film distributor (e.g., films bought by Jean Desmet), or in specific theaters (e.g., films exhibited in the theater Le Parisien in Amsterdam). Another focus within the social media history focus can be a specific media work, as it was found in this study, with a scholar researching about the transnational media event that took place when the trial against Adolf Eichmann was broadcast. This scholar uses what (s)he calls "production analysis" as a method, consisting in an attempt to reconstruct how a media event took place (the technologies and institutions involved)(p4-h).

As opposed to scholars with other focuses, a scholar with a **social media history focus** does not have the need to perform a formal analysis of the moving images. Likewise, Brown (2002) found that not all music scholars engage in music analysis (65,9% of a total of her sample). In the case of the research of music theorists, the approach used to analyze a given piece or pieces of music is a distinct method (e.g., a Shenkerian analysis), indicating that analysis depends on the specialization area.

Among researchers with a **epistemological research focus** the use of formal analysis was also identified, and similarly to the previous researchers, also of selected scenes from specific movies that serve as their cases(p7-e).

Among scholars with a **data-driven research focus**, interest in analyzing their sources is mediated by the facilities provided by automatic data processing techniques. They perform a "distant reading", a term originally coined by Moretti (2000), currently understood as a way of analysis focused on patterns, quantitative approaches and intensive use of data, which increasingly uses computational facilities for processing it. This is because in order to understand the development of cinema as part as broader networks, and to find cross relations with other media or cultural industries (e.g., television or theater), this research focus needs structured factual data and mechanisms to connect them. As part of the analysis, scholars with this focus performe network analysis (with tools such as "Gephi"), and other information systems that enable patterns visualizations and maps (i.e., to locate people, places and events geographically and on time). Following Aversa' (2012) comparison between the humanities and the social sciences, the data-driven approach seems to become closer to the social sciences where experimental and quantitative methods are more common than the use of interpretation of texts and artifacts (Aversa, 2012, p. 3).

Following there is a detailed description of the main types of information needs and seeking strategies of the studied scholars.

7.6.3. Types of (information) needs and seeking strategies

This section presents and discusses the findings of this study's third research question (*RQ3.3*) about the most significant characteristics of film scholars' information needs and seeking processes for moving images in relation to their research and teaching tasks.

This section is structured according to the typology of information needs proposed by Ingwersen and Järvelin (2005) described above (§7.3.1). From section 7.6.3.6 until 7.6.3.9 it discusses additional issues that emerged from the analysis. The previously identified research focuses also are used here.

The concept of "seeking strategy", following the previous definition of information seeking (§7.3.2), is assumed to include all kinds of procedures for searching and seeking, being or not mediated by an IR system. The strategies related specifically to IR systems are described later (§7.6.5).

7.6.3.1.Known item

Seeking for specific media works or information about them is the most common self-expressed need from the studied group of film and media scholars, mostly among scholars with an aesthetic/narratological, cultural/documental and, to some extent, epistemological focuses. Knowing the specific film or media titles (i.e., knowing the items), usually comes after or during a process of reading, interpretation, and source chaining that points to media works that could be part of the corpus to be studied. In this process, the scholars rely heavily on secondary sources.

Similarly, in the domain of visual arts, the information gathering process is often based on finding authoritative writings on an object or subject, followed by an attempt to discover additional relevant information, which supports the development of an original interpretation of the object within in its different contexts (historical, iconographic, formal, etc.) (Stam, 1984, as cited in Beaudoin, 2005). In the visual arts domain, Larkin (2007) additionally found that most scholarship "is propelled by an image supported by related text and secondary images, [and that] interest in one compelling image can precipitate an exhaustive process that sometimes involves information-seeking within the domain as well as in related disciplines" (Larkin, 2007, p. 3).

Indeed, film and media scholars may have seen a few movies in advance (for instance in the case of the German crime television movies between late 50's to late 60's topic), but subsequent selection is heavily supported by information found in magazines (e.g., Variety$_{(p5-a)}$, books (which are intensively used at least during the initial research stages$_{(p12-a;p5-a)}$, and newspapers (for their reviews, for instance in The New York Times$_{(p5-a)}$[154]. These are the

[154] There is no evidence about the relative frequency of use of books versus journals in this study. Hence, it was not possible to observe whether the case would be the same as in previous findings in the humanities, such as Stone's (1982) study, which observed that "a recurring theme is that in the humanities the former play a greater part than the

sources that lead the scholar to discover new media works and actually *know the items*, as well as to justify and contextualize their choices. This intertwined connection between the primary objects (the moving images) and their paratexts (see Chapter 6) explains Layne's (1994) finding that one of the main needs of art historians is the linkage between images and textual works. Indeed, Neal has also concluded that "text and non-text forms of information elucidate one another" (Neal, 2012, p. 2)

As it was observed from Study B, knowing the items, i.e., being able to identify specific media works is one of the main skills of being a film and media scholar (§6.5.3.3). That is why it is common to find claims such as: "I search for information I have beforehand"$_{(p2\text{-}e)}$, especially in relation to the use of IR systems. Even in the case of having to locate scenes or fragments within a media work, scholars often know which "item" they are looking for, meaning, in this case, which particular fragment they are searching. The way of searching a specific sequence is often top-down: from the previously known movie to the scene[155]. If it does not happen this way, the most common situation, almost for all the interviewed scholars, is that they know how to locate the scene they are looking for, often relying on their **memory capacity**. This skill develops after having seen a considerable amount of movies$_{(p8\text{-}h;SB,p3)}$. Two scholars also mentioned that they may use their personal notes$_{(p1\text{-}a)}$, and that (s)he was even trained on how to use a card system for this$_{(p8\text{-}h)}$.

The importance of good memory was already identified as one quality of art historians:

> "Primary is the internalized memory of like objects in the whole or in part which gives rise to mental images or the revisualization on command from the observer's trained experience. Most art historians can do this fairly well; some great scholar-connoisseurs have extraordinary visual memories." (Brilliant, 1988).

In relation to seeking and searching strategies for specific media works, this is mostly done by using the main identification data, the "issness" in Ingwersen and Järvelin's (2005, p. 271) terms (e.g., movie titles and or directors' information) as key entries for looking up for further information or location of the actual items. Scholars in an aesthetic/narratological, cultural/documental or epistemological focus, use often keywords from titles, authors, directors, years, medium or form in their searches.

7.6.3.2.Muddled item (media work identification)

Muddled item needs also occur frequently. These consist of the lack of identification information at the "issness" level. This deficiency may occur in two cases: (1) when the scholar forgets a title, or a director, but knows other properties of the media work being sought, or (2) when the media works themselves do not have identification attributes, i.e., when they have not been named by curators or scholars, or when they exist or circulate in

latter" (p.296).

[155] (p4-h;p7-e;p4-h;p5-a;SB,p3)

without proper identification metadata (e.g., in online video sharing platforms).

The first option listed above is not common among the interviewees (not in the group of scholars from Study B either), since good memory has been already identified as an essential skill, or also because of the existence of supportive databases to retrieve the missing information (§7.6.5.3). The second option occurs more frequently. Indeed, **film or media works identification** may be part of the work of the scholar, especially in early periods in film history (see Chapter 8 for a specific case). Film/movie identification of contemporary movies is less of a problem for researchers in more recent periods, although there is still the issue of released titles in different languages in these cases(p2-e)..

The fact of being specialists allows the scholars to "deduct" several characteristics of the film works when metadata is scarce. Basic generic metadata such as "European film", '1960', 'black and white', can orient the experts (SB,p1). These few data combined with their knowledge can motivate several hypotheses or conclusions about the type of film under consideration. In other cases, information seeking takes place outside information retrieval systems, by asking colleagues(p1-a;p9-a). This last case is similar to known topic needs, which are discussed later (§7.6.4.3).

Copy information, or what a scholar called "vaults information" is a key for scholars with an aesthetical/narratological focus in order to identify the items ("color, format, preservation, digitization, what is presented at the end, all the layers around film as a source")(p10-cd). Even though it is assumed that this information is provided, this may not always be the case, and archives should take care of presenting restoration history or digitization details in the cases when this applies:

> "Also all kind of online information about which films are there, if accessible or in which archives are them. There is no one way to find this information, especially on how has been done with the film in the past, if it has been restored, if there are different versions... if you go to versions such as DVDs, it is hard to trace back what elements are used for one or another, what am I watching here, what am I analyzing. There is no clear answer to this; it is a combined approach."(p14-a).

The scholar from the previous quote was happy to see that when (s)he was searching in a film archive's catalog for a specific film, (s)he got information on which documentation existed about those films, but also information about the history of the copy: "this film was considered lost, but a piece was found…"(p14-a).

But copy information may not be only of interest for a certain group of scholars, but a serious issue related to source criticism, or to what Dougan (2015) calls "edition literacy." Indeed, a young scholar complains that even among senior film scholars this information is sometimes missing: if you read a film analysis, it is rare to encounter an explanation from the author saying which copy or editions (DVD, YouTube, original print) they are using for that, but according to her/him this is an essential component of a critical, scholarly reading of a

source(p14-a;p4-h). One of the participants was aware of this need and commented: "what I do now when I analyze and discuss an image, etc., is that I try to give information on which copy am I exactly using: if it is a DVD based on a copy of an archive, etc.)(p1-a).

Muddled item needs also occur when the scholar attempts to locate a **specific scene** which (s)he remembers, though not the movie to which it belongs to. Participants in this study did not report this case often, neither the participants from Study B (probably because of the good memory that characterizes film scholars). In few cases when this happened, scholars would use the aforementioned top-down strategy (using known features from the media work), but in any case they would not use content-related keywords such as 'crossing the (sight) lines' or 'subjective shot' (SB,p2) for the search. A scholar expressed a special reaction about the idea of being able to find these "forgotten" fragments by using content keywords in an IR system: "but then the whole fun of looking for the fragment or sequence is gone […] because it is also fun looking for the film, watching it again"(p4-h).

7.6.3.3.Known topic and "subject access" (motifs, themes, concepts)

Known topic needs occur when isness* elements are unknown and seeking for terms or information about the items is based on preliminary information about their subject or content characteristics. That is, the media items are not identified in advance, and the seeking process starts with a topic in order to locate the corresponding relevant items to the content or subject characteristics.

Hjørland (1997) defines this need with the term "subject retrieval":

> "Subject retrieval is the search for unknown documents (as opposed to a "known item search") whose contents can contribute to the solution of a concrete problem or satisfy a need for information. All kinds of data which can give a clue (even a vague one) regarding the identification or evaluation of potentially relevant documents can be used in subject retrieval, including the document's own data (such as title, abstracts, list of references, author) or data different from the document itself (including classification codes, descriptors, book reviews, evaluations, and citations in other documents)" (Hjorland, 1997, p.5)

For scholars with an **aesthetic/narratological focus**, a central concept here is that of motifs, which could broadly be identified with topics, from a narrative perspective (this concept is defined in Chapter 2, §2.7). In this study, there are few examples of scholar's motif-based research. For instance, one participant was interested in representations of after-life, and how dying is visualized in movies(p5-a). Another participant investigated different adaptations of the same play, which dealt with the narrative motif of "telephones" and "last minute rescues". The scholar further comments: "some motifs are very rich (e.g., railways or other means of transportation), they can be looked in two ways: as a narratologist (how they trigger certain stories), or as an enthusiast (in trains, in cars, etc.)"(p1-a). The second option listed by the scholar corresponds to a cultural/documental focus (see §7.6.1.3)., in which known topic

needs are more common

Known topic-related needs are also associated with seeking media based on genre. In the next example (described in the context of a conversation about searching on a typical film archive's catalog), the scholar departed from a need of finding movies about city symphonies (known-topic, which consists of a combination of genre, topic and style). The participant described the problems associated with this search:

> "It also depends on the question that you have: if you go there and ask for a title (do you have Ruttmann's Symphony of a great city) you get an answer, but part of my research is if there are other city symphonies that nobody wrote about before, and of course you cannot find those... they are not written about in books... if I go there and ask if they have city films from the 1920's and 1930's, or maybe even for one year: which city films do you have for 1929?, this is a hard question and I don't know if I will get an answer to it"(p14-a)

This type of (re)search deals with what Kirkegaard and Borlund (2008)'s called the identification of "borderline exemplars", or "prototypical exemplars" (Lakoff, 1987, as cited in Kirkegaard and Borlund, 2008, p.119). This occurred in these authors' research when a participant had the research objective of defining a new television broadcast genre (p.119). Another example, in the study described here, happened when one scholar had to investigate a new collection of movies in relation to an existing genre. At some point the scholar was asked by the film archive to do some research about a group of unknown films, they wanted someone to explore what they had, and to have some ideas about how to work with them. The scholar explains:

> The main topic was westerns, but that in itself is interesting, because I am not interested in westerns at all, but I was looking at these movies that were about the west but that were not westerns as we know them, because the western is mostly based on classical cinema, and I was looking at the period before so, it is kind of theorizing that, how do you search for roots for something that is not there yet, with hindsight looking at the period before, and where you have a search light, like what kind of movies do you consider western, and how broad does the body of film become […]"(p2-e)

In these cases, after using different research and seeking strategies, the scholar may end up with a deeper identification (the item becomes "known" for film scholarship), or propose one identification of the characteristics of those media works in broader artistic and cultural contexts. These activities are an example of how information seeking constitutes an essential part of the scholars' research activity, that is, the phenomena under investigation are the media sources themselves. This is different in other disciplines, especially in the sciences.

An additional example occurs, as in the previous types of needs, at the scene level. One scholar tells the case of his/her need to find scenes where farewell messages are sent in a mediated form (where people use media to give a farewell message, for instance as in the movie "My life without me"). Another case (as narrated by one participant) is about a

colleague looking for scenes including a theater audience where someone uses a looking glass to look at the screen.

The main seeking strategies associated with known-topic related needs in the case of scholars with an **aesthetic/narratological focus** can be summarized in four aspects:

(1). The use of the scholar's previous knowledge as a point of departure for the seeking process, by using information from a few films (s)he already knew about the topics to continue the seeking activity. For instance, while talking about searching for genres, one scholar said that, as experts, they are supposed to know which movies are representative of certain genres: "I have been trained for years to have this repertoire in my head"$_{(p5\text{-}a)}$. This comment leads to insightful similarities with the work of art historians. In Brilliant's (1988) analysis it is also described how art historians create these **mental repertories** of artworks, usually beginning their study of an object with a categorizing intention: "it looks like…", seeking to find after other objects and images that complement the "proposed resemblance" (p.122). Brilliant continues explaining that, when the scholar fails to find these similar objects, then they look into existing collections of comparable images and forms, which are familiar to them as "trained scholars". He summarizes these collections into (1) objects in museums, (2) archives of photographs or other audiovisual materials and (3) illustrated publications (Brilliant, 1988, p.122). Except for the "illustrated publications", of which there was no evidence in this study, this explanation perfectly suits the film and media scholars.

(2). Contacts through the **academic network** seemed to be one of the main seeking strategies: "normally people draw on the knowledge of others, this is a form of *crowdsoucing*, a scholar says$_{(p1\text{-}a)}$. Consultation may take place face to face, but also commonly through mailing lists of professional associations which the scholar is subscribed to. Collaboration seems to be high since the scholar amusedly commented: "the problem is that you can get all the mailing list replying [laughs]"$_{(p1\text{-}a)}$. The issue of community support while seeking will be explored more in detail later (§7.6.5.6).

(3). The seeking process may be aided by subsequent searches on authoritative **filmographies** that use subject terms as entry points[156] (see §7.6.3 for further comments about this type of source). However, an IR system may not be used for motif-based searches (e.g., telephone and last-minute rescues in films). This attitude may be due to two factors: (a) because a search for a keyword such as "telephone"

[156] Brilliant (1988) analyses the equivalent of "filmographies" in the field of art history, what he calls: comprehensive indexes, miscellaneous corpora, subject-specific lexicons, or general catalogs: "the familiar staples of the reference collections of any decent research library". The limitations of these kinds of sources are analyzed by Brilliant, the main on being the need to rely on verbal descriptions of the artworks. An obvious advantage for the art historian who needs to examine the images themselves is to have reproductions available in those indexes, concludes Brilliant. In the case of moving images, this would imply for instance, have each film indexed by the Film Index International (or even by IMDB) available for viewing. This is not currently the case, and the film scholar often has to locate in other ways the individual films identified through these reference sources.

"would give an unhandable amount of films"(p1-a); or (b) because topic related searches (e.g., 'labor movements') may make the scholar feel that (s)he is using the corpus of somebody else (SB,p1). Thus the scholar does not use the topic/motif itself as a keyword in an IR system: "I have never really tried to search for types or motifs, I generally would go for titles, years, filmmakers, actors…"(p1-a). Only few scholars (younger) from both studies commented to have tried this search for specific forgotten scenes by using scenes' descriptions through an open search in Google or YouTube(p2-e;p13-h).

(4). Additionally, relying on **secondary sources** remains as one of the main seeking strategies[157]. This is associated with activities of scanning, which are discussed later (§7.6.4.4). Also, personal libraries play a role in these cases.

Within the **cultural/documental focus**, since research questions are not about individual works, but about topics that are treated in several (sometimes previously unknown works or sources), **known topic needs** are more common. As it was described before (§7.6.1.2), as a way to document broader investigations, scholars with this focus (sometimes not even a film scholar, but a historian or psychologist, etc.) look for objects depicted or used in the media, or for themes that the media are about, or that are treated them in detail. In this cases, as in the mentioned example about portable radios (§7.6.1.3), the main seeking strategies can be summarized in: (1) information obtained through colleagues (scholars who have seen a lot of movies and may remember where certain objects are depicted), (2) visualization of several movies produced during the historical period of concern, or movies produced at another moment that recreate that period, or (3) looking for references in secondary literature about the topic, what Layne (1994) referred as to indirect searching, through books that are about them (e.g., women in art, etc.) (Layne, 1994, p.33). In the case of the portable radios, there was a scene from one film of the year 1950's in which one of those devices was prominently used as part of the scenario. This scene served as one of the illustrations (together with newspaper photos or ads) on how these machines were used back then.

The known topic needs also occur in the **epistemological focus** (e.g., representations of media in media(p2-e) or television as new technology(p7-e).

In order to search for known topics search different types of keywords and subject entries are used: 'video blog', 'video diary', 'personal video blog', 'weight loss diaries', 'advertisement + fridge + 1950', 'fan productions', 'fan videos', 'insanity', 'shell shock', 'madness', 'technology', 'bioscoop + 1935', 'illustrated lecture + 'holland', are just a few examples of keywords that the participants used to search for their topics in specialized databases or general search

[157] Although it was not investigated in this study, literature on this kind of behavior report different strategies for what Bates calls "Berrypicking": "In addition to subject searching in bibliographic databases, people also do footnote chasing (moving backward through the literature by following up endnotes and footnotes), citation searching (moving forward through the literature by using citation indexes to see who has cited a given item or author). Journal run (identifying a central journal in a subject area of interest and reviewing its contents pages), area scanning (browsing the materials collocated with other items already located), and author searching (searching for other works by an author already located) (Bates, 1989, p. 412). The techniques are not limited to this set." (Fisher, Erdelez, & McKechnie, 2005, p. 61)

engines. There are different types of semantic categories in these terms, as will be discussed later (§7.6.5.9). One participant who was proud of how successful (s)he was in finding the most relevant images for her classes, explained that she never uses the exact corresponding terms to what she is looking for but simpler factual terms around that (e.g., if (s)he wants images of women's independence during the period of post-World War II, (s)he will use keywords such as 'kitchen' or 'fridge' + 1950)$_{(p8\text{-}h)}$. Another scholar also uses this strategy in searching for moving images, and explains that (s)he has to start "very open", meaning not using the actual keywords that corresponds to the topics of interest (e.g., 'democracy'), but to concrete terms such as 'Holland', or 'the Netherlands', often in the title field$_{(p11\text{-}cd)}$.

7.6.3.4.Browsing and muddled topic needs

Known topic related needs may involve intensive exploration of potential media works or sources of information about the topic or media.

Three examples explain typical ways of searching that occurred among the participants in relation to topic-related needs. Using White & Ross (2013) concepts, these examples illustrate the three seeking strategies proposed by these authors: 1) exploratory browsing; 2) focused search; and 3) exploratory search. Important to realize that White & Ross proposed these concepts in relation to searches mediated by IR systems, but it is possible to use it in a broader seeking context, occurring both within IR systems or not:

(1). Exploratory browsing. A scholar searching for videos related to a topic on an online video sharing site said to spend hours in what (s)he called "browsing", something that (s)he was thinking may not be very academic$_{(p6\text{-}a)}$. The scholar was engaged in a refining her/his corpus, tuning the source selection with her/his research problem definition, in that sense (s)he was "expose[d] to collection content to help relate the problem context to similar documented experiences and promote information discovery." (White & Roth, 2009)

(2). Focused search. A scholar who did not remember a film title, used topic related keywords (e.g., 'boxing') for the search within a specific catalog that (s)he knew beforehand. The scholar was 'reading through the catalog', trying to find the threads to a forgotten film, or to discovery of new relevant films about certain motifs$_{(p1\text{-}a)}$. In this case, the scholar has a clear goal in mind (to find a specific movie title), but is also open to new discoveries based on the original topic need. This corresponds to what White and Roth called "focused searching", in which the user has a clear sense of her/his information goals and the trails to follow in order to reach them, but (s)he is also open to testing or refining hypotheses or ideas found at earlier stages, for instance, during exploratory browsing.

(3). Exploratory search. A scholar reported to "browse" the web with no clear purpose while preparing her/his lectures in search for illustrations, but commented that

searching "openly", as (s)he called it, is a form of "procrastination"(p2-e). Later the same scholar, who has an epistemological focus, additionally highlighted the possibilities that the Internet [meaning general search engines] brings for exploration and "speed":

> "I do rely a lot on that sense [meaning time saving] on the internet, what it brings to me, if I need something, examples…, or if I want to write about [a topic], [I say to myself]: let's see what the Internet gives me […], I expand from it"(p2-e).

In this case, the scholar engages in an open-ended exploration departing from broadly defined topics. As White and Ross (2013) explain, "exploratory searches are as much about the journey (and the learning that occurs) as the destination, if a destination exists." This journey has an impact on the person's knowledge acquisition and learning.

In the first case above, there was evidence of a transformation of the scholar's known-topic related need, for known items once (s)he identified them through other sources(p6-a). After using different seeking strategies, as described above, the scholar may end up with a final selection of (known) items. Likewise, Kirkegaard and Borlund (2008) identified four phases of the studied group of media studies students and scholars, which they summarized in: (a) getting an overview of transmitted broadcasts, (b) identification of borderline exemplars, (c) selection of specific broadcasts, and (d) verification of facts. Again, these activities are an example of how information seeking constitutes the very basis of the scholars' research work.

Additionally, since known-topic related needs are associated with browsing activities, there is a higher degree of openness which can produce "accidental discovery", or **serendipity** (Case, 2007, p.90). Even though scholars mostly engage in known item searches in IR systems (as it will be discussed in §7.6.4.1), this does not mean that serendipitous encounters do not occur during seeking or search, or that scholars do not like to discover new things(p5-a): "I am a very serendipitous kind of researcher I am happy to discover things out of the canon; also literature wise"(p1-a). Open browsing and serendipitous encounters may be more common at the earlier stadium of research: "this is very important in the beginning, to find relevant films, find literature, information on the materials, restorations, people working on the one or the other film or topic."(p14-a). On the contrary, for senior scholars exploratory browsing may be limited by time constraints: "You never do that [explore], you say, 'I will have two hours or so to explore those resources, but you never find that time"(p2-e).

A scholar also points to the fact that full-text retrieval may have reduced these non-expected encounters: "Serendipity in my work has actually been diminished by online research because I can search directly specific search words through the digitized newspapers, rather than having to go through the newspapers page by page or on microfilm"(p13-h). Another study found similar attitudes among historians in their use of E-books, which use was considered by the scholar as one factor reducing the "serendipity factor" that occurs when doing "shelve reading" in a physical library, which seen to have a positive impact on historical research (Quan-Haase & Martin, 2011).

Finally, it is possible to observe evidence of a preference towards exploratory browsing (first case mentioned above) within the boundaries of specific collections or systems, instead than towards exploratory search (third case mentioned above) in open systems, such as through general web search engines. Three participants with an aesthetic/narratological focus explain this preference:

> "The google book search has been very fruitful: I found the existence of books that I had never heard of and that have been useful for my work. I love navigating through google books: it gives inspirations and a landscape of what has been published and said on one subject and/or by one author. YouTube also gives useful related films recommendations."(p12-a)

> "serendipity not so much, but browsing is important, also through sites such as amazon."(p5-a).

> "My work is not really influenced by [browsing and serendipity] - I may follow links online but only within historically valid systems, so I know what I'm doing and don't leave a professional frame of reference (which I had way before the internet)."(p9-a). […] Having said that, I must add that I react to chance-browsing-encounters, of course - but my perspective on those encounters still is a systematic one (I really don't like getting lost in the link-possibilities of the internet - it consumes your time and leads to little)(p9-a).

More research needs to be done to understand the role of serendipity as part of the film and media scholarly work, mainly in relation to moving image seeking, since in any case, source "discovery" is one of the scholarly primitives (Bradley & Vetch, 2007).Current studies may shed light or serve as a point of departure, for instance, Foster and Ellis (2014).

However, it seems that most of the interviewed scholars in this study may not be keen on online browsing with no purpose, which may be somehow due to the fact that information seeking based on muddled topic needs (not precisely knowing what to look for) is not common. Indeed, previous studies found that "humanist scholars aim at adding new knowledge to a topic in which they are already knowledgeable, and in which they have previously completed some research (Grover & Hale, 1988, p. 11, as cited in Kirkegaard, 2008, p.55), serendipity is then associated to "encounter unfamiliar items", as Kirkegaard remarks. Experienced scholars may also feel rejection to finding sources in this open browsing way on the web. One of the few scholars that showed strong critical attitudes towards general search engines said:

> "I do not want to waste my time in this commercially digitized world […] if I find something that is interesting, I cannot say if it is useful because I don't know if it is valid, I have to double check always. The internet is not a big encyclopedia, […] you have to pick up the pearls and check if they are if you find them"(p9-a).

To conclude, the previous findings agree with Kirkegaard and Borlund's (2008) study of media studies students and scholars. In their study, they identified muddled topic needs occurring in the initial phases of the interviewees' information processes, when they intend to get an

overview of the broadcast that were transmitted at a certain time, trying to locate what Kirkegaard and Borlund called "borderline exemplars" (§7.6.4.2). This precisely corresponds to what in this study has been referred as to "exploratory browsing", mostly associated with known topics than to unknown (muddled) topics in the case of film and media scholars.

7.6.3.5.Known and muddled data elements

Scholars with a social media history focus mostly present data-related needs, which include production company names, distributors' names, exhibition dates and locations (see Chapter 8 for more details). This involves intensive archival research as the main seeking strategy, which includes not only moving image archives, but other types of archives, (e.g., municipal archives), national libraries and research institutes(p13-h), or city archives and university collections(p11-cd). A rare but interesting case is business archives(p8-h) (see Chapter 8).

Although comparing sources of information is a common practice for film scholars regardless of their focus[158], for scholars with a social media history focus this becomes more intensive in relation to verifying the accuracy of the data(p13-h). There is a need for looking up from different sources to obtain data, which the scholar may prefer to obtain from a primary source rather than from a secondary source(p4-h). Data extraction and organization of the recorded data is highly important for these scholars, representing several challenges (see Chapter 8).

7.6.3.6.Access-related needs

Access to primary sources (more specifically to moving images) is a fundamental issue in the analysis of film scholarship. In what concerns the scope of this study, evidence was found that research questions may even be forced to change depending on what kind of sources are accessible(p4-h); or that a topic may be easier than others if the objects of investigation are accessible(p5-a). Access to the sources (for instance due to copyright expiration dates) can attract researchers and produce intense work on certain areas, such as in the case of early cinema studies, as opposed to other time periods, for instance "nouvelle vague"(p12-a).

In relation to actual access-related needs to the moving images, there are differences between the research focuses. As suggested before, a scholar with an aesthetic/narratological focus, similarly to art historians or iconographers (Brilliant, 1988, p.122) needs to examine the images themselves; likewise, a researcher with a cultural/documental focus may need access to entire or parts of media works, and sometimes also acquisition for reuse purposes is needed.

In certain cases, even more for the social media historian, secondary sources or other primary sources are the only way to know of the existence of a film or media, or even to reconstruct how a film was, if it has disappeared or is impossible to locate. The scholar may get to know

[158] This is indeed one of the "scholarly primitives" defined by Unsworth (2011).

about a film only from a few remaining still images[159], and may realize that images can also be a good source for research when the films do not exist or are not accessible(p14-a). For the social media historian, this type of "reconstruction" may be enough, or even unnecessary. But for a film historian with an aesthetic/narratological focus, finding any part of a lost movie will always be a necessary challenge[160].

Even though most film and media scholars (except social media historians) need actually to watch the media, it is not equally important to have access to original copies for all of them. This depends on the historical period of focus and the research topic. For instance, not all researchers with an aesthetic/narratological focus may need to analyze the original version (what is properly called a "film" in the material sense) but for film historians this may be needed. In exceptional cases, scholars with a cultural/documental focus may still need to access original copies and actually analyze them (e.g., for research on technical properties such as color).

This need to access the media works by certain groups of film scholars also appears in one of the dimensions found by Kirkegaard and Borlund (2008) in relation to the information needs of media studies students and scholars. The authors called it "the archival dimension", consisting of the need to know whether and where the media items (broadcast in their study) have been stored, and hence can be obtained for further analysis (p.119).

When there is a need for original copies the debate about access versus preservation may interfere with the work of the scholar. This tension is still controversial and of high importance in film archivology and scholarship[161]. One participating scholar explains:

> "Especially since the 1980's the awareness is growing [about the need to see the originals]. Prints themselves carry meaning, for certain analysis you have to go as close as possible to the material […]. We also have to be aware that some materials have always had restricted access, but for students, for instance, video is fine; some archives have kinds of hierarchies, students, master students [...]; for someone writing a term paper the archive wouldn't use the original."(p1-a).

Before the **digitization** boom, scholars had to visit the archives and even travel long distances in order to access the materials of interest(p12-a)[162]. Researchers had to look actively for places where the films were screened to be able to know them for the first time: "gloves, security, payments…"(p12-a), watching a film on site and taking notes or copying by hand all the

[159] Frame enlargements in this case, not the film stills produced as publicity material.
[160] This is the case of the reconstruction of films such as "Napoleon" by Abel Gance.
[161] The historical tension between preserving and exhibiting originates in the fact that most films (in the material sense of the term) can be damaged or even perish when projected. Two emblematic figures of film archiving represent the different poles of the debate: Henri Langlois (founder of "la Cinemathéque Francaise") and Ernest Lindgren (the NFA's founder and first Curator). Jeavons (2007) summarizes the debate in these two well-known statements: "To show is to preserve," said Langlois. "No," said Lindgren. "To preserve is to show." Lindgren's policy was to provide viewing copies to the users only when proper conservation had been done in the originals while Langlois would show every film that he owned, at the risk of causing them damages." This debate is re-contextualized in the current digital landscape in the book "Film curatorship" (Usai, Francis, Horwath, & Loebenstein, 2008).
[162] Professor Ivo Blom, experienced film scholar, published a series of reccommendations for novice researchers on how to prepare for a research visit to a film archive: 'Where can I find Italian silent cinema?', in: Giorgio Bertellini ed., Italian Silent Cinema. A Reader (New Barnet: John Libbey, 2013), pp. 317-323.

intertitles(p1-a;p12-a), were just few of the common practices that constituted the work of the film scholar.

This has radically changed after the same film works they sought became available in commercial DVDs or online. Having a working copy on a VHS made a different for the scholar with an aesthetical/narratological focus and significantly influenced her/his research(p1-a). One scholar refers to the example of Raymond Bellour, a film structuralist, who had to go to the movie and take notes in the dark, and come to see the movie again, only in one case he used a flatbed; he also writes about that experience (memory problems, thinking you saw something, but it's wrong)(p5-a). In the course of thirty years, access to films has profoundly changed film scholarship(p1-a). The novelty of digital access is still perceived: "the general idea of getting material from the internet I still find disturbing"(p9-a). Altman (2009, as cited in Geisler et al., 2010) comments on this historical change:

> "whereas in the 1960's and 1970's film was primarily accessed by scholars and students through museums, festivals,, and public screenings –or individual access to low-quality Super 8 or 16-mm prints- the availability of media on videotape and laserdisc on the 1980's made repeated viewings more practical, and enabled increased focus on film-specific analyses and broad histories based on in-depth research."

Digitization and the online availability of moving images represent difficulties for the scholar with an aesthetic/narratological focus, for whom distinguishing which version of a movie (s)he is watching or analyzing may be challenging. At a deeper level, digitization "has definitely changed the way scholars look at sources […] digitization has opened up, but also covered up the layers that can go on top of the films as material sources"(p10-cd). Low-quality copies that were used in the past to give a "gist of the films"(p1-a) may be used nowadays as a replacement for good quality prints or digital copies.

Scholars who specialize in video, face different difficulties, not only associated with huge amounts of unordered productions in online sharing websites, but also high costs of access to avant-garde videos in specialized distribution platforms, such as Videodatabank(rw).

For scholars with a social media history focus, moving image digitization and online availability seems in certain cases to obscure contextual information: one scholar complained about the fact that once his/her object of study (a broadcast event) became available online, it was harder to find contextual information about the specific way in which each country broadcast the event, the context (what was broadcast on the same day) in which it was programmed(p4-h).

In relation to the different **access levels**, entire productions are the focus of attention for scholars with an aesthetic/narratological focus. In the case of early cinema researchers, this need does not exist, since most films are short and can be fully viewed easily or the scholars know them by heart(p1-a). Access to specific scenes may be common for researchers with a cultural/documental focus and for teaching-related tasks.

In the case of social media historians, access to different **paper archives** presents several

challenges. Although the situation may be changing with massive digitization of newspaper archives, in certain intensive and long-term projects, when this digital newspaper archives do not exist, the researcher may have to travel and expend a considerable amount of time exploring this rich source of information. Just to get an idea, one scholar calculated her/himself the time (s)he spent at newspaper archives: (s)he traveled 70,210 kilometers by railway and plane to the library. Once there, (s)he would seat in the reading room daily for eight hours during three months, looking at 55,000 meters of microfilm. Also beforehand, (s)he spent a year and a half in the initial country looking at the newspapers(p13-h).

Moreover, the difficulties for **digitization of film-related materials*** may indicate that physical access to those materials may be the only possibility in the forthcoming future. This is because of copyright issues, but also because of their different forms, shapes or stylistic features and the enormous amount of document types that are produced around a film at different moments. Fortunately, in many cases they are kept in film archives as accompanying dossiers for on-site consultation(p1-a).

7.6.3.7.Types of information needs for teaching-related tasks

Most of the participant scholars are both teaching and researching. In a certain way, their information behavior for both types of activities presents different characteristics. Consequently, they are each presented separately. In the previous sections, the focus was on research, while in this section is on teaching.

In the case of teaching related tasks, source selection for basic and regular courses on general film history or culture, may be often based on pre-defined titles that are part of textbooks or the canon(p2-e;p4-h). But it may also be the case that the scholar's critical way of thinking makes her/him deviate from this and choose non-typical examples(p9-a).

The scholar may face the need to update her/his materials: "some clips always work, others work only for some years"(p8-h). At the master level, or when topics are too specific, the scholar selects the examples from her/his own collection or, again, by asking colleagues. **Known item** search also occurs in this case(p2-e), as well as an intensive use of YouTube (see §7.6.4). Additionally, themes can also be used in teaching(p9-a).

In educational activities (or for dissemination at conferences), scholars frequently use **clips** to exemplify something (e.g., certain uses of film language or cinematographic techniques: camera movements, left to right, up and down, moving cameras, etc.) which are not possible to explain through textual sources(p5-a), or to show short teasers such as trailers or recaps(p6-a). The need for finding specific fragments (clips), as it was observed before, is mostly common among the scholars in the aesthetic and cultural/documental research perspective, but also for teaching- related tasks regardless of the research focus.

The practice of finding clips has changed radically after the appearance of **YouTube** (§7.6.5.2), nowadays the most used medium for this study's participants to obtain clips. The reasons for this choice are the easiness for the teacher (no need to cut and extract from their own

collections anymore)(p1-a), and the easiness for the student (they can access them online and after the class). This is also due to changes in formats and equipment(p8-h) since current scholars are bound to media systems for reproduction and display (DVD players, data processing systems and beamers)(p9-a). It is also common that students can access those clips in a closed network of their virtual learning environment, as it was mentioned by a scholar from study B (SB,p3).

In pre-YouTube times, the scholars had to bring their own materials to class and set the right time to show the wanted fragments. With the rapid change in formats, equipment to play their sources became obsolete(p4-h), also with increasing number of students, providing access to analog sources becomes more difficult(p2-e), or it may not be feasible to buy a large number of sources themselves(p2-e). Some scholars still use their own sources(p2-e;p1-a) and/or do the digitization and editing work themselves (e.g.,SB,p7); this may also be due to their wish of selecting what they really intend to show and is not available(p2-e), instead of adapting themselves to what is available in YouTube or the like. Scholars also prefer actually to download the clips that they find rather than streaming them online in their classes, this is both to avoid advertisements (which may present a serious problem for teaching film analysis)(p4-h), or for avoiding technical problems with internet connections(p5-a).

The need to extract fragments originates from the fact that most movies are too long for the duration of a regular class. For that reason, one scholar chooses early cinema films for his introductory courses, to be able to use films as a whole and discuss entire structures(p9-a).

For research, or even less in the case of teaching, **original copies** of the media are not often needed, and almost never are used in the classroom. However, one scholar insists that as part of teaching film history, students should see real films and projectors as part of seminars(p9-a) and that teachers should not be using materials that far so far moved from the actual aesthetic quality of the material that is on a 16 or 35 mm print(p9-a). This scholar mainly uses his own collection, stating that (s)he prefers "these secondary media (VHS, DVD and digital files) [since] historically and concerning picture quality is better than anything on YouTube)"(p9-a).

Also, **exploratory browsing** based on known topic for teaching related tasks is not uncommon in the studied group of scholars. As an example, one participant describes how (s)he found the images (still) for her/his PowerPoint presentations: her/his task is often to find an image that not only exemplifies an idea that (s)he wants to explain to students, but something from which they can learn(p8-h), related to cultural or historical aspects. For instance, this scholar needs to talk about life in the nineties fifties in the United States, the role of the wife, how women became more independent, and (s)he wants to convey the idea of a kitchen princess. Thus, the scholar uses Google images and the keywords 'advertisement' + 'fridge' + '1950'. (S)he explains that (s)he always has those keywords [for every search], contrarily to his/her students, who may lack this skill. While talking aloud during the search activity, (s)he demonstrates to have a very rich domain and cultural background knowledge which may explain why (s)he has a rich set of keywords. When the scholar sees an image, (s)he knows

that is what (s)he was looking for, even without having seen that image before(p8-h). However, this is not an easy task and may take several hours(p8-h), the scholar concludes.

Additionally, evidence was found that it is not uncommon that scholars link their research activities to their teaching activities, by involving their students in research-related tasks(p2-e;p8-h). This issue is related to how the student acquires research skills. Film scholars consider that information seeking is one of the key **skills** that a student should develop in order to be able to perform source criticism and appreciation. For instance, in a course work the student may be requested to analyze how certain television programs reprocess historical knowledge(p2-e), this requires a high level of seeking and search skills, even higher in the current digital context, which brings new challenges to film and media scholarship (see §7.6.4). In this sense, access to online paper archives and/or secondary sources, such as film magazines, is changing the way of **teaching film and media history in the classroom**. As one scholar comments, sources such as the Media History Digital Library (§7.6.5.2) are allowing scholars to work together with students doing archival research in the classroom(p8-h). One highly relevant project for the aims of this thesis was described by one scholar: it consists of the use of the "Media thread" platform, which allows students to perform multimedia analysis in a collaborative environment of which also the teacher is part. This software, developed at Columbia University, supports the task of teaching film analysis since the student can develop his/her own writing and support his arguments by using fragments which are embedded in the essay. The teacher can then revise the claims made by the student as a result of her close reading, by looking simultaneously at the fragments in which (s)he based them. This platform also facilitates online discussions. The scholar who has worked with this platform has discovered that students perform better when these annotation tasks are given in the contexts of broader assignments or supplemented with face to face meetings. This initiative of using the "Media thread" software as annotation platform has been used in the "Media ecology project" (this was described in Chapter 2, §2.8).

7.6.3.8.Scholarly community support in information seeking

The personal and individualistic nature of humanities research is constantly reported in the literature before 1995 (Bouazza, 1989; Stone, 1982; Watson-Boone, 1994; Wiberley & Jones, 1989), although rudimentary informal networks, as well as informal, personal contact as valuable source of information, are also mentioned in those studies. Stone (1982) remarks that one consequence of working alone is that collaborative efforts are less normal than in the sciences, where there are strong "invisible colleges", or more structured networks. However, this isolation was not found in more recent research. A recent study about citation patterns of researchers in the humanities, reflected on the fact that even though individualistic working traditions of humanities researchers, or their preference to work with their local audience is well-known, "all scholarship is international, and the humanities are no exception […] Not only does the research itself take place in an international context, but humanities research is universal by nature" (Must, 2012, p. 527).

Although it was not the purpose of this study to investigate patterns of scholarly communication among film scholars, the findings clearly evidence that there is not a strong individualistic behavior among the studied group. Indeed, a strong sense of community, mainly around one area of film scholarship (early cinema) was found in this group. One scholar amusingly comments:

> "Early cinema researchers are a bit "maniac", it is difficult to reconstruct the story, it is far away and many films are lost, but when there is a possibility to reach a source, all the community organizes itself in order to make it possible for everybody to look at it. There are debates, conferences. I don´t know if this is the case in other fields of cinema research […] it is a friendly and helpful community"(p12-a).

A similar case was shared by another scholar in relation to people extremely interested in movies (not necessarily film scholars). (S)he calls this network "the scene," referring to this community of interest, which includes not only direct colleagues but also other "cine maniac" friends(p10-cd).

In general, there is evidence of the **informal nature** of collaborations in the studied group of scholars, which confirms previous findings in that the way that humanities researchers communicate with each other also tends to be relatively informal (Collins & Jubb, 2012). One scholar suggested that cooperation between the disciplines [in the humanities] was not that common(p5-a). Recent studies have found that this tendency is changing, though. For instance, Collins and Jubb (2012) report on a recent study which found that 65% of humanities researchers had collaborated beyond their own department in the previous five years (Meyer et al., 2009, as cited in Collins and Jubb, 2012).

Interest in **attending conferences** (or specialized archival festivals depending on the research focus) is high among the participants in almost all areas. This interest can be higher among young scholars, since it facilitates creating a **network,** which is crucial not only as part of career development, but in order to be able to know or ask where certain film materials are located(p14-a). These networks also include film or television archivists or curators, which may eventually be contacted by the scholars when there is a need to locate sources that are not online, or are difficult to retrieve from their catalog(p2-e). For scholars working with films, not having these contacts can be a serious obstacle to research(p10-cd).

Even though scholars do not seem to work in isolation and colleagues and networks are essential for film scholarship(p2-e), film scholars do tend to **publish alone**. Indeed, after examining the authors of the 615 publications by scholars in the studied group (as listed in each one of the fourteen scholars' university profiles, including journal/magazine articles and books), an average of 85% of the publications was authored by a single person. However, it is also common to find collective publications (edited books) and conference proceedings, in which these individual contributions appear. This fact of publishing alone may reflect the previous finding related to the importance of subjective viewpoints in film scholarship and in the humanities in general (§7.6.1).

Even though this study did not investigate the impact of technology on scholarship, as for instance Rose (2002) did, nine of the fourteen interviewed scholars were researchers long before the increased use of the web, and consequently could reflect on the fact that the internet has given a new dimension to scholars' networking and collaboration. Communications are faster, and it is easier to exchange sources with colleagues. On the other hand, because many sources are accessible online, contacts that were only established for requesting sources may have diminished(p8-h). One participant summarized the changes that it has brought to her/his work: faster communication with peers, possibility to naturally ask others who have access to sources to provide them, option to look at other catalogs or archives, and search for information that is validated by experts(p9-a). Other studies have shown that academics usually acknowledge the revolutionary aspect of information technologies in their disciplines at the level of speed and ease, rather than a more conceptual level (Collins et al., 2012, p. 89). In Chapter 8, there is evidence that film scholars are going a step further, "pushing the intellectual boundaries of the discipline", as Collins et al. suggest it should be.

7.6.3.9.Leisure and keeping up to date

Everyday life information seeking is the study of information seeking behavior in the context of "non-work" related activities, focusing on how people encounter information during leisure time or hobby-related activities, for instance, during the consumption of media (Savolainen, 1995, as cited in Case, 2007). Although the study presented in this chapter did not focus on scholars' non-job related behavior in relation to film, television or media, several comments provide a brief overview of a couple of key points that could be further investigated.

An interesting issue is whether watching movies is an activity that is also part of the leisure time of the film scholar. The participants who commented on this somehow provided opposite views: for instance, one scholar did not distinguished between work and leisure(p9-a), while another one commented that free time should be used otherwise (e.g., gardening, as the participant suggested), since many films have to be watched for work(p8-h).

In the first case, scholars may not lose any chance to watch a film. For instance, one scholar has attended specialized archival festivals for decades, which are an occasion to watch unknown films(p1-a). In these cases, it is common that the scholar's personal interests coincide with their research topics(p9-a). In the second case, scholars expressed somehow less interest for watching particular films or movies(p11-cd;p13-h), and commented that what may count in going to the cinema is the social experience rather than the actual film(p2-e). Not coincidentally, the second view was shared by scholars working on social media history (for whom, as it was observed before, the interest in watching the actual media works is less than for researchers in other focuses).

In movie selection for leisure (again, if this can be separated from work) scholars may follow

similar criteria to other moviegoers(p1-a): "interesting films to watch; recommendations; critics; reviews; things I heard or read about…", or from an active social network:

> "In my opinion the active and personal communication within "the scene" I consider myself a part of (not only direct colleagues but also other cine maniac friends), still is the best way of choosing films, because all the people share an understanding of film and cinema which makes the whole thing rewarding […]"(p10-cd).

Others also choose based on Facebook recommendations(p10-cd), or may decide based on YouTube trailers(p14-a). Watching popular television series as a way to keep up(p2-e) or just for fun is not unpopular among the interviewees(p8-h;p10-cd;p2-e). Some participants explained that they would prefer to go to the cinema, rather than seeing the movies at home, only in cases when there was a higher visual interest in them(p10-cd;p5-a).

In relation to how film scholars **keep up to date**, the participants mention the following sources and channels:

- mailing lists or scholarly associations newsletters(p2-e;p11-cd;p13-h;p5-a;p12-a;p14-a);
- discussion with colleagues (also during specialized festivals or conferences)(p12-a;p14-a;p14-a;p9-a;p5-a);
- an institutional film seminar(p12-a;p14-a);
- specialized magazines (print and online)(p9-a;p13-h);
- Facebook groups(p2-e;p14-a);
- new book publications(p9-a);
- search engine alerts(p12-a); and
- Google(p2-e).

Guest (1987, as cited in Watson-Boone, 1994) found that faculty members preferred to use for keeping up to date, in this order: references in source materials, book reviews, colleagues, specialized bibliographies, the library catalog, publishers' catalogs, abstracts/indexes, and librarians, which were consulted the least. Among the participant scholars in this study, libraries are used in specific cases, although librarians were not mentioned as a source for support (see §7.6.5.4).

Lack of time seems to be a common problem of scholars nowadays, not only for leisure related activities(p10-cd), or in keeping up to date(p14-a), but in some cases also for research, i.e., when the scholar has to choose between different approaches or sources, time constraints may influence the final selection(p1-a;p2-e). Lack of time also may impede browsing and exploratory search in new information services when there are more pressing duties, such as teaching(p2-e).

At the same time, the speed at which information retrieval or processing systems are being constantly developed challenges researchers. Senior scholars have witnessed deep changes during their careers caused by changes in information technologies, and can tell their

experiences of the radical transformations in their work(p12-a;p1-a), but also junior Ph.D. researchers face constant new developments and feel the pressure to keep their research up to date with new technologies(p14-a).

The previous sections of the findings focused on the scholars' research topics, types of sources and information needs and seeking behavior, regardless of the use of any particular IR system. The next section looks into the scholars' search behavior and to their use of specific IR systems, or information systems in a broader scope (e.g., libraries, archives).

7.6.4. Information systems and search behavior

This section describes the findings of this study's fourth research question (*RQ3.4*) about film and media scholars' search behavior and their use of particular information systems.

Although some relevant types of sources and information systems used by scholars have been already discussed in the context of their information-seeking behavior, this section looks more in detail to the types of information systems that the scholars reported to use in their research or teaching activities. The basis for structuring this section is a small survey that was conducted among the fourteen participating scholars from the media department of this case study. They were asked to rate on a seven-point Likert scale how often they used different types of information systems in their daily research and teaching work (Appendix J)[163]. They were also asked to comment on their choices and to explain, using talk-aloud techniques, how they performed their most common searches.

Figure 7.1 shows the frequency of use indicated by participants, and this section explains and discusses the most common search strategies described by the participants of Study C. In this context, a search strategy is defined as: "a plan, which may contain moves, tactics, and/or stratagems, for an entire information search[164]" (Bates, 1990).

[163] Additionally, as part of Study B, the 10 participant Spanish scholars were also asked to indicate their frequency of use of these systems in a three point Likert scale (Questionnaire No.2, Appendix I, q.11). The results are highly similar to those in Study C: with most scholars choosing "usually" for general search engines, followed by free online databases and online video services. Proprietary film catalogs or indexes are used rarely or sometimes, while specific film archive online or offline catalogs are used more often than in Study C, as well as going or sending requests to film archives also are rated highly in Study B.

[164] In Bate's (1999) conceptualization, there are different levels of search (system mediated) activities: search moves (identifiable though or action), search tactics (one or a handful of moves made to further a search), and stratagems (a larger, more complex set of thoughts and/or actions than the tactic).

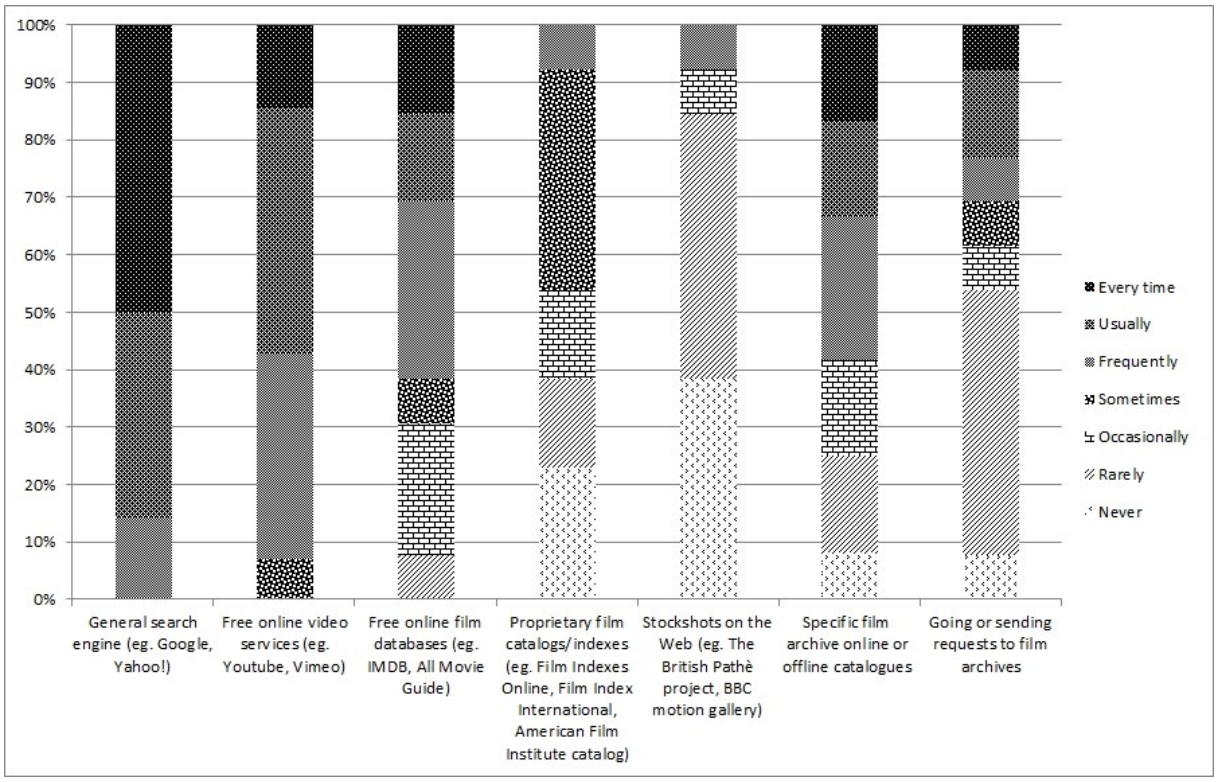

Figure 7.1. Film scholars' searching behavior: use of information systems (Study C).

Figure 7.1 shows that general search engines are used most often, followed by free online video services and free online film databases. Film scholars rarely use image banks or commercial stock shots. Although film indexes and bibliographies may a priory have been considered an essential bibliographic tool for any film scholar, they are not used often. Film archives, both offline and online (their catalogs or website) are frequently used by some scholars, but barely by others.

However, the distribution of the information systems frequency of use shown in Figure 7.1 is only an indicator of the scholars search behavior (based on the most commonly used information systems and IR systems), which has to be observed in the context of the overall information seeking process described in the previous sections. Additionally, the survey was not designed with a rigorous quantitative approach. As it can be seen from the interview guide and/or questionnaire in Appendix J and Appendix F, the scholars were presented with a list of systems or groups of systems in order to motivate the discussion. They could rate their frequency of use and subsequently comment on their choice, in the context of the discussion. Hence, the quantitative results cannot be studied independently from the interview data.

The next parts of this section summarize the participants' opinions about the main systems, which are grouped according to the categories used in the survey (Appendix J) and using other categories that emerged from the information systems mentioned by the participants during the interview (§7.6.4).

7.6.4.1.General search engines: Google and the "black-box" paradox

As Figure 7.1 shows, general web search engines are the IR system that was reported as being most often used in the daily research and teaching activities of the participating scholars. Google is the preferred general web search engine for most of the scholars interviewed. Only one scholar thoughtfully chooses another search engine (IxQuick) for its higher respect to privacy(p11-cd).

These findings seem to agree with Kemman, Kleppe, & Scagliola (2013) who carried out a survey among almost three hundred humanities scholars in the Netherlands and Belgium about their use of online systems, finding that Google "is the key player among available search engines".

However, in relation to previous findings (§7.6.5), it is important to consider that the use of information systems (such as general web search engines) has to be seen in the context of the overall information seeking and use process of the film scholars (described in §7.6.5). That is, before or simultaneously with the use of a search engine, there are several other sources used (including people) and several seeking/searching mechanisms that may be or not mediated by information systems[165].

In this perspective, the quantitative results presented in Figure 26 as well as the quantitative results by Kemman et al. (2013) study have to be taken cautiously. This is because when the scholar is asked for "Which of the following search engines, websites or databases do you use?" (as in Kemman et al.'s study, p.8), or to rate the frequency of use of a given information system on a Likert scale (as in this current study), search behavior is being isolated from seeking behavior, leading to the paradox that Kemman et al. found in their study:

> Our overall findings indicate that Google is the key player among available search engines. This dominant use illustrates the paradoxical attitude of scholars toward Google: while provenance and context are deemed key academic requirements, the workings of the Google algorithm remain unclear. We conclude that Google introduces a black box into digital scholarly practices, indicating scholars will become increasingly dependent on such black boxed algorithms. This calls for a reconsideration of the academic principles of provenance and context (Kemman et al., 2013, p.1).

In the study reported here, there is no systematic investigation of the effects of the increased use of Google in film scholarship. However, considering the overall seeking behavior described in the previous sections, several subtleties may explain the paradox found in the cited study. The main reasons for the frequent use of Google among the interviewed film scholars could be summarized in five aspects: (1) Look-up and access to known sources; (2) Defined "exploratory browsing"; (3) "Focused search"; (4) Entry to other information systems; (5) Support. These four aspects are described next:

[165] Indeed, as Järvelin & Ingwersen (2011) suggest "recent theoretical and empirical work in information seeking suggests that IR is but one means of information seeking which takes place in a context determined by, e.g., a person's task, its phase, and situation." (Jalervin and Ingwersen, 2011). Moreover, "current systems for information retrieval (IR) are designed to support only one kind of information seeking behavior: specifying queries using terms to select documents from some database. But, IR is in fact accomplished by people in much more complex ways than just this method of query specification and selection" (Cool & Belkin, 2002, p. 2).

(1). Look-up and access to known sources. Based on prior knowledge, the scholar searches for specific sources to check whether they are available online, or for information on how to locate them. As it was highlighted in previous sections (§7.6.3.1) the predominant type of need among this group of scholars is for known items. The items become known after a carefully crafted seeking process. This was also encountered by Kirkegaard and Borlund (2008), who observed that in the case of media scholars the identification of items is solved "prior to any interaction with an IR system" (p.119). In this case, the role of the search engine is subordinated to serve as a retrieval tool for accessing those specific sources that are often known without the mediation of the search engine as such. This corresponds to the "archival dimension" described before (§7.6.3.6). Indeed, one of the interviewed scholars suggests that the best thing that the internet brought to them is access to their sources(p5-a). This also happens in the case of secondary sources: "I look for books very quickly, I cannot imagine how to do it without the internet, I used to go to libraries, taking books from the shelves and copying them [… now if the book is not online] I use Amazon to look at the index, and I teach this to my students"(p5-a); "In my daily work, I like the fact that I can look at things in Google books (I wouldn't know in which page was something useful for my work, I could use an index, but not all books have one)"(p7-e).

Also, the general search engine is used in several cases to find complementary information about a media work, which can be clearly identified or not (see point 3 below). In these cases, when isness* metadata elements are known they are used in the search (i.e., a film's country of origin). Some scholar may go directly to the specific national film archive when they know the country of origin (SB,p7), but others may start directly their search in Google, knowing that the IMDB results will immediately pop-up (SB,p3). One scholar said that her search order was: first the national catalog, then Google to see if there is something else related to her source, and third YouTube, in the case there are non-accessible films somewhere else (SB,p1).

(2). Defined "exploratory browsing". As it was described in previous sections (§7.6.3.3), topic-based needs are also common among film and media scholars (and among other scholars in relation to the content of the moving images). It was possible to identify three reasons for the role of the general search engine in supporting known-topic needs:

a) Curiosity. In relation to the scholars' own topic, (s)he may use the general search engine driven by the question: "what is on the web about my topic?" Because of the widespread use of general search engines, it may also occur that the scholar, out of curiosity, types his/her research topic into a search system and observes "what pops up"(p10-cd).

b) Expansion. In relation to a research topic, the scholar looks up for pointers to sources for known-topic searches, it was observed that search results are used as keys to

continue the investigation, but not often as the sources to be used in the research. In other words, the lack of distinction between authoritative sources (e.g., film archives) and general online data is not common. This was evident for film historians with an aesthetic/narratological focus. Young researchers may not even be certain about whether the sources found through this kind of "googling" are valid and can be cited(p14-a).

c) Illustration. In relation to the search for illustration for teaching or presentations. For example one scholar prefers services such as Google images for the easiness to find illustrations for his/her classes (instead of having to scan his/her sources and store the files)(p8-h); Google images, (s)he says "is very unreliable, but usually what you need is there", after hours of searching(p8-h).

(3). Focused search. This happens when the scholar needs to cross check or trace for new clues related to a case under investigation, for instance, when identifying a film (muddled-item related needs, §7.6.3.2). In this case, general web search engines can support the "detective" work of the scholar, who may use a wide variety of key(words) derived from elements that (s)he may come across with through other sources (e.g., the name of a projector, or exhibitor)(p13-h).

(4). Entry to other information systems. Scholars often use Google as a way to locate specific information systems or services. For example, instead of typing the direct web address of "IMDB" or using their bookmarks (some scholars have organized bookmarks,(p14-a), they may enter the system name in Google, for instance by typing a particular system's name together with a topic keyword instead of going directly to the specific web address (e.g.,: 'satellite technology' + 'BBC')(p4-h), or simply typing the name of the system alone (e.g.,: 'IMDB'), which reduces the effort of having to remember its precise web address and/or save it as a bookmark; this also happens in the case of YouTube(p13-h), when the scholar looks for moving images through Google, and then filters by "videos". It was observed that the scholar may say in this case that (s)he used Google, instead of saying that (s)he used "IMDB" for instance (e.g.,SB,p3). In most cases, the scholar knows the system or service beforehand. In other cases, the service may be discovered through Google if the scholar encounters it in the results. The opposite case also happens, that these systems may never be discovered if their content is not retrievable through a search engine(p10-cd).

Indeed, as Kemman et al. found, it happens that some scholars assume that all collections are findable through Google. For instance, one scholar said that for her/him Google was the gateway to anything that was online(p2-e), playing perhaps the role of the overall portal to the different archives, since it was hard to predict in advance in which system it was possible to find specific information: "it is very often arbitrary what archive holds, it is unclear for a person like me to trace what would be the most likely archive to hold certain images, you would like it to be accessible through the massive archive"(p2-e). This view,

however, is not the same among other participants. For instance, one of them expressed that (s)he does not like to think of "one single portal" that gives access to all the data that (s)he needs, but prefers to explore different sites, including blogs, or receive input from students and colleagues about relevant sources (movies) for her/his research$_{(p7\text{-}e)}$.

(5). Support. Scholars also used the search engine to look up for meaning of words, to get translation services, or to find general information about an unknown concept that they came across within their sources. Additionally, even though having a good memory was identified as one characteristic of humanities scholars, the general search engine was also used for memory support[166]. There was evidence of this tendency in at least one or two of this case study's participants. This kind of support from the search engine is what may seriously impact the work of the humanities scholar (as suggested by Kemman et al.), when the scholar loses expertise in finding this information in other ways that are not mediated by a search engine, they may become exposed to the manipulation or limitations imposed by search engine results. However, there is evidence in this study to conclude that this is not (yet) happening among film and media scholars.

In sum, the main reasons for the highly frequent use of a general search engine (i.e., Google) among the interviewed film scholars in the context of their overall seeking processes seem to correspond to the "Lookup" activities categorized by Marchionini (2006). Figure 7.2 shows the main types of "search activities" proposed by this author: Lookup, Learn, and Investigate. There was no evidence of the use of the general search engine for the two last activities, although, as Marchionini suggested, it was observed that lookup activities were embedded in learning or investigating activities.

[166] There are several studies about the impact of Google in memory capacity. This was the topic of a recent keynote speech: Cognitive Consequences of Search, Keynote Address, Information Interaction in Context (IIiX) Conference, Njmegen, The Netherlands, August 23, 2012.

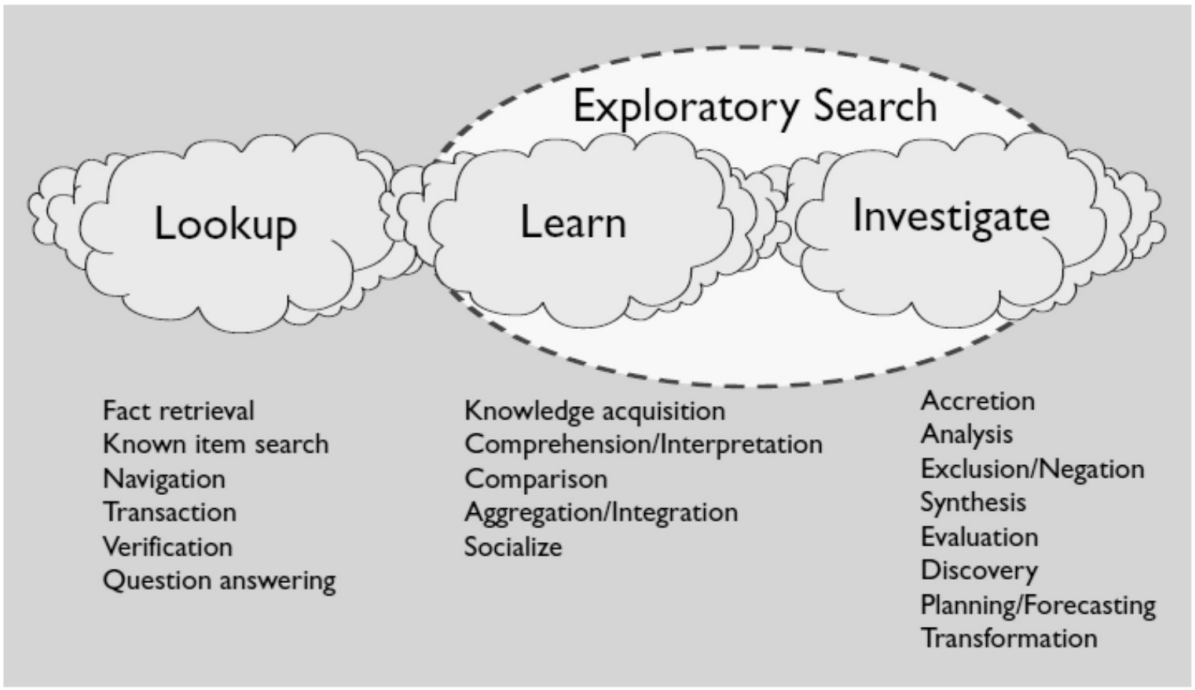

Figure 7.2. "Search activities". Source: Marchionini (2006).

Given these points, and even though this research did not focus on the impact of information technologies on film scholarship, one could hypothesize that the issues raised by Kemman et al. may not be changing the discipline (yet) in a significant way, since the search engine is subordinated to support lookup search activities in a broader seeking behavior context. Hence, film and media scholars (as they are also humanities scholars) are less exposed to the "black box" or hidden algorithms than for instance first year bachelor students, who may rely only on the search engine for learning activities.

Most compelling evidence for significant transformations to film and media scholarship may originate from a preference towards primary sources that are digitally accessible. Indeed, there was a growing self-reported "laziness" from a few of the participant scholars in using materials that are not online. This is evidenced by a preference towards the Internet to obtain primary (and also secondary) sources. For example, one scholar commented "if you are searching for the material object then you need the actual [physical] location; it is different if you just need to grab something from the Internet"$_{(p2\text{-}e)}$. But, in general, most scholars in this study are aware of the amount of sources that are not digitized$_{(p11\text{-}cd)}$ or would prefer "not just pick up something..."$_{(p8\text{-}h)}$. The changes in film scholarship may come when the scholar loses awareness of the existence of other sources that are not digital, when (s)he does not know anymore how to find them, or even more, when they give up on the need for provenance and context information of the artifacts (analog) or digitally born media and their reproductions.

7.6.4.2. Free online video services (YouTube and other video sharing databases)

Even though the scholars in this study are aware of the problems posed by social sharing platforms such as YouTube[167], in practice this or other online video systems are recurrently used. If not often for research, the most common use is in the context of teaching. This may be for finding clips for their teaching courses[168] (see also §7.6.5.2), for using fragments or frame enlargements for power point presentations$_{(p1-a)}$, for getting a first picture of what sources may be available$_{(p14-a)}$, for quick check of the validity of certain statements that the scholar makes when (s)he is writing about a movie$_{(p1-a)}$, or simply for private amusement$_{(p10-cd)}$. One scholar commented that even if she started searching via another system (s)he would end up in YouTube when (s)he could not get access to the materials$_{(p4-h)}$. Occasionally for their research, the scholars also find media works in YouTube that were not accessible in other ways (e.g., a film once broadcast on television and hard to access at any film or television archive$_{(p9-a)}$.

It also happens that film archives or specialized institutions have a **YouTube channel**, in which they present some of their collections (e.g., BFI). This can make the scholar more confident in relation to trustworthiness and provenance$_{(p1-a)}$. Two scholars regretted the disappearance of the site "Europa Film Treasures", predecessor of EFG, "a precious collection of 194 completely restored films dating from 1890 to 1970" (Eunews, 2013), but were glad that their material ended up in YouTube$_{(p1-a)}$. These channels were small at the beginning, but with the increase in uploaded items, the search facilities become limited for scholarly work$_{(p1-a)}$. The quality of these moving images is also often poor$_{(p1-a)}$.

YouTube reflects the overwhelming amount of available online media, posing epistemological dilemmas to the scholar (see also §7.6.1.5). In this context, the lack of identification and/or production information (e.g., isness* metadata such as creators, date and country of creation) represents an essential problematic issue, since it presents barriers for source identification and provenance information, that is, the "history of the copy: if it is restored, rewritten" or even manipulated. A scholar refers to this as a problem to the "**deontology of research**", the need to know most about your source$_{(p12-a)}$. Scholars see the need to alert the students of the need to be aware of manipulated scenes (for instance when a different sonorization is added)$_{(p5-a)}$. One scholar prevents that there may be a **misuse** of YouTube even among scholars: "this is the culture we live in, we have to learn how to navigate the big amount of sources, and students should also learn to differentiate"$_{(p5-a)}$.

Other video sharing services, like **Vimeo**, are significantly less used than YouTube. Vimeo seems to be used for certain purposes, such as accessing better quality movies that are uploaded by their creators (the scholar may get a password to watch one specific production)

[167] There are several discussions around YouTube. One important source is (Snickars & Vonderau, 2009).

[168] (e.g.p1-a;p2-e;p2-e;p4-h;p6-a;p10-cd)

(SB,p1) or, as it is the case with other specialized websites, when they find Vimeo results through a general web search engine(p10-cd).

7.6.4.3. Free online film databases

Examples of online film databases include "The Internet Movie Database" (IMDB) or "All movie guide." The first one is frequently used among this study's participants, in most cases serving the purpose of finding specific details about a previously known film title. Scholars recognize the "commercial" orientation of this database and are aware that for certain historical periods or topics it is of no value (e.g., medical films, or early cinema), they are also uncertain about its complete accuracy since it is not clear how is the content created or who is responsible for it(p12-a;p14-a). One scholar suggested that if (s)he would rely only on IMDB (s)he would not be a good scholar, an expert in what (s)he is supposed to be(p5-a). Participants from study B confirm this perception.

Scholars in this study did not report on using social recommendation systems such as "Movielens" or "Letterboxed" (see Appendix M for a list of information systems).

7.6.4.4. Film/media archives

Participants also were asked to comment on their use of film and media archives in their activities. This use could be either of their online website or catalogs or through actual visits or direct requests. Their answers show that film and media archives are not perceived as equally relevant for scholars in different research perspectives.

Film archives may seem irrelevant for a non-film historian, i.e., when the focus is for instance on contemporary blockbusters or current emergent media(p5-a;p7-e). In this case, the film archive may be perceived as a place to look up "old materials". Conversely, film historians may actually go to the archives to see what is "new", meaning undiscovered things, "trying to broaden the sense of film history"(p9-a). Actually going to the archive, doing "archive research" is time-consuming for the scholar(p2-e;p9-a), and it is not as common as it was before online availability(p1-a). Nowadays, a proper visit to a film archive may be reserved for more detailed research, as a Spanish scholar from Study B pointed out (SB,p3). Getting properly immersed in the archive's collection may not be essential either for a (new) media researcher, even though the way of presenting those collections online may be an object of study(p2-e).

On the contrary, in other cases, the point of departure for young scholars is the film archive, as in the case of early or pre-digital cinema(p11-cd;p14-a). In certain situations, the archive itself has done research on specific collections, perhaps with the help of a film scholar(p2-e); if this is all documented, it can be a valuable source for new scholars around the topic(p11-cd).

But online film archives' catalogs or websites are considered a reliable source for information about the films (even if these are not accessible online)(p2-e;p14-a). One of the main changes that Internet has brought to film scholarship is precisely the possibility to have access to

those catalogs(p9-a). Indeed, **national catalogs** or **filmographies**, usually maintained or created by public organizations in coordination with film archives, are also commonly used by film historians, for example "German Film Portal" (Filmportal.de)(p9-az, or "Cinemexicano" (SB,p1) by a Spanish film scholar.

Efforts for creating **collective film archive catalogs** already exist (e.g., NAMID and MIC, European Film Treasures, EFG/Europeana). EFG is one of the most important projects aiming at creating a unified film catalog in Europe. The use of such **aggregators** varies greatly among the participants: some have never used them, and some use them frequently, for instance when the scholar is interested in one particular collection or project, such as the First World War (EFG 1914)(p10-cd) or early cinema research(p9-a). Not without reason, since their collections overlap, this site is often confused with "Europeana", which evidences a problem of the aggregators pointed out by a couple of scholars. There does not seem to be a clear distinction between the specific contributors, and it is hard to know what is it possible to find beforehand(p10-cd;p14-a). In that sense, the scholar may prefer to go to each individual film archive's website, also because aggregators may be incomplete or interrupted at a certain time(p14-a) due to sustainability problems(p1-a). Selection criteria may also be problematic, as for instance the geographic perspective emphasized in "Europeana", EFG, Euscreen, and the like which are useful in case that your search is relevant to Europe or European perspectives, but maybe not otherwise(p2-e). Making sense of how the information is aggregated may also be an issue: "What is what and how are they related?" asks one participant when discussing about European aggregators such as EUScreen and Europeana(p10-cd).

Film archives may be perceived as only focused on films (the movies), giving priority to their preservation and digitization over that of film-related materials*. This may be a sensible issue for social media historians. A particular case occurred in which the film archive was not certain about whether preserving a collection of "scrapbooks". The curators contacted the university department to discuss the decision, and the scholars realized the research potential of this source in evidencing historical connections, which finally served as the basis for a master thesis. Some archives, the scholar explains, have more sensibility to this need, while others solely see themselves as "film" archives(p8-h).

Film material is also encountered in other archives that are not necessarily film archives (e.g., military archives have film sources that can be of interest for one of the researcher's topics)(p10-cd). Some of them may not even be preserved at institutional archives, but by private collectors(p11-cd). Similarly to the way in which film scholars also use other types of archives in search for their sources, scholars from other disciplines may be supported by film archives. In these cases, the archives may attract broader audiences and find a chance to bring its collections in an interesting way to the public. A scholar tells the case of one large collections of original nitrate material that was offered to the BFI (the Mitchell and Kenyon Films collection) and the way the archive successfully involved the public into research around it (folklorists looking for local dressings, sport historians marveled actually to see a

play from which they only had photographs, etc.)(p1-a)[169].

Film libraries or **university libraries with media collections** also play an important role in scholarly research (and teaching). Usually each film archive has its own library, and may be the way for the scholar to get DVD copies and see newly edited on DVD –if the scholar does not decide to buy it her/himself(p9-a).

In relation to interfaces or information systems to access the film archives' collections, scholars commented that they may be difficult to use(p2-e;p13-h), or not give a precise idea of what the archive actually holds (the difference between the library collection and the film collection may be not clear in certain cases)(p14-a). This may be more problematic when the scholar looks for film materials at archives with a broader scope, for example, the Museum of Modern Art(p12-a). One scholar commented that there were many things going on in the world of online databases: "it is a bit of a wild west to me, there are lots of separate collections that don't help when you search, and when you use he "overall portal" (I don't know how to call it) [referring to the search facility provided on the home page] you end up in a section in which you don't know if what you are looking for is there"(p2-e).

This kind of deficiency is compensated by the support of the researcher's network, that is, through personal calls or contact with the archive's curators, "through the back door" as one scholar amusedly said(p2-e;p10-cd). When the scholar does not know how to find her/his sources, (s)he may rely on the archive's personnel to perform the source selection(p10-cd).

Television archives are also used regularly, mainly among the scholars in the "cultural/documental" (as historical sources)(p14-a), and "social media history" research perspective(p2-e), although they may in some cases be perceived as more difficultly accessible than film archives. One scholar, who was searching a broadcast event recorded in video tapes, contacted archives such as NBC, CBS and ABC without success. Lack of access facilities were also reported in the case of West Germany television archives(p4-h;p9-a), and with a large part of the German newspapers or films, which do not seem to be extensively digitized(p10-cd;p1-a). However, more recent broadcasts may be online and easier to find(p6-a). Some television archives may also have their catalogs online, for instance the East Germany television archive, or the Paley Center for Media(p4-h), or Beeld en Geluid, a point of reference for Dutch media scholars(p2-e). The aggregator Euscreen is also used for teaching and research purposes by television scholars(p4-h). However, in relation to this particular aggregator, one participant suggested that in order to support researchers better than Google does, it should have better quality keyword access(p8-h).

Film and media archives are increasingly providing online film clips as "teasers" for the entire movies (see for example EFG). Other ways of online presentation based on small fragments are also explored by some film archives mentioned by scholars in the study. One of the cases is the project "The scene machine" (rw) (§4.6.3). However, this kind of remixed presentation of

[169] The case is described in (Toulmin, Russell, & Neal, 2003)

movie clips centered on their topics is problematic for scholars to be used as a historical source. This way of presentation, one scholar suggests, becomes a "works of art" in itself, precisely valuable because of their randomness, a way of an archive to show its own identity(p10-cd).

The relation of the scholar with the archive may be different in the case of **teaching**: some scholars regardless of their research focus send their students (mainly master students) to research at the archives and/or about the archives themselves, for instance looking at their interfaces(p2-e).

7.6.4.5.Proprietary film catalogs or indexes (filmographies)

Filmographies or film indexes have an important role in access both to films and to secondary scholarly literature. The major ones are "Film Index International", "American Film Institute Catalog", "The International Index to Film Periodicals", and "Film and Television Literature Index" (Perrault et al.,2012). Not all scholars use these sources on a regular basis, and some researchers, mainly young, may not even be aware of their existence altogether(p4-h;p14-a).

The printed versions of these sources were familiar to scholars before the widespread use of the internet. Their use though may have decreased because they are not freely accessible online(p10-cd). Scholars who were familiar with the printed versions may find their online editions limited or more difficult to browse and get quick overviews, and also having fewer options for filtering(p1-a).

Brown (2002) also found little use of specialized online indexes among music scholars caused by "some of the long-standing inherent problems with the major abstracting and indexing tools, RILM and The Music Index", such as slow updates, lack of efficient bibliographic control. Brown agrees with Bates (1996), who in a summary of the Getty End-User Online Searching Project, stated that ''the distribution of amount of end-user online searching by the scholars falls out into a familiar pattern of a few using it a lot, and most using it little'' (p. 516).

7.6.4.6.Stock shots on the Web (moving image databanks and footage services)

Moving image footage services such as 'BBC motion gallery', 'Getty images', 'ABC Video Source', 'Stock footage online', 'Footage.net' just to name a few examples, are barely known or used by the interviewed scholars. This may be due to the fact that these services have a commercial purpose and mostly target audiovisual producers who need specific images or shots to be reused (as it was described in the work of the "film researcher", §7.4.4).

However, there is potential educational or research use in these services, some of which are freely accessible (see Appendix M). For instance, one scholar found a way to engage students with a "transmedia storytelling" study about a television series from the 60's by using one of these footage services. The information system provided images of spacecrafts of the time that were used in the extensive newsreels of British aviation, which served as support for the

student's investigation(p2-e).

7.6.4.7.Other relevant information systems

Besides the information systems presented in Figure 26, scholars mentioned a wide variety of other collections (online and offline) that support their work, or commented on the reasons for not using some of the examples presented in the questionnaire. They are grouped into four categories that are described next, in order of importance.

(1) Personal libraries. Many participants indicated that they have a personal collection in their houses which serves their main needs(p1-a;p2-e;p8-h). One scholar considered it an important piece of scholarly work(p9-a). They consist mostly of books, DVDs (acquired commercially or through festivals) and VHS copies(p4-h). Personal digital collections and personal information management were not systematically studied in this thesis, although in Study B several issues appeared, mainly related to the problems of organizing personal collections of digital media works and clips. In that study, some participants provided evidence to think that information needs, classification categories, and eventually ways of ordering personal collections, may develop around the topics used for teaching (e.g., European cinema, Italian cinema; and/or specific directors, or chronological arrangements) (SB,p7). Ordering physical collections of DVDs or VHSs may not represent a problem in this sense. However, different scholars expressed difficulties in organizing their clips' collections (e.g., SB,p7).

(2) Film/media specialized services or digital libraries. Even though most scholars declared to use a general web search engine such as Google as the starting point for a search, one part of that use may be attributed to the need to actually locate a specific web system or service where the actual search will take place. Appendix M contains a list of those websites mentioned by the scholars or somehow used during this study. Examples of relevant information systems or digital libraries include:

- Thanhauser.org. One scholar promotes this among students and publishes his papers there. It has an encyclopedia of the history of the company from 1909 to 1918, of high interest for early cinema researchers(p1-a).
- The Media history digital library is a voluntary effort to provide access to film and media secondary sources. Its search engine (called "Lantern") "is the happiness of early cinema researchers"(p12-a), since it allows "systematic research" on journals that were normally scattered across different archives or libraries and required a lot of travels to be consulted(p1-a). This system is allowing scholars to innovate in teaching archival research to bachelor students. The retrieval mechanism does not allow for full-text search in all magazines together. Thus the scholar has to open each individual issue to perform a keyword search (e.g., for 'Jewish'). Even though this may sound difficult, the scholar finds it a great possibility compared to how it was before(p8-h).
- For social media historians, organizing data is an essential task. This may not be done

by a single scholar, but by a team, or through different periods of time. For that purpose, scholars developed an information system as a result of several projects, a database called "Cinemacontext"(rw). This allows scholars to collect all data related to exhibition and distribution of films in the Netherlands since 1900.

(3) Newspaper archives. As suggested before (§7.6.3), newspapers are a key source for media scholars in general, and more essential for the social media historian. Newspaper archives play a key role in supporting media scholarship, and new digital access facilities have a clear impact on the scholars' work, not only in relation to efficiency, but also in terms of scale. For some scholars, what a few years ago took a week (e.g., exploring the newspapers in microfilms), nowadays takes one day today through digital archives(p8-h). One system that these scholars use regularly is "Delpher"(rw), the system that provides access to the Dutch digitized newspapers. They also indicate access problems due to digitization quality(p10-cd;p4-h). One scholar suggests that the newspaper archive of the newspaper "Leeuwarder Courant" is a better example since it allows full-text search, but still it is possible to visualize the whole page and not just the single article (this is because the scholar wants to have an overview of the events' context)(p8-h).

(4) General digital libraries and other web services. Nonfilm or television oriented information services or digital libraries are most commonly used among scholars in the cultural/documental and social media history research perspective. They mention services such as:

- The Internet archive (Archive.org), which can also provide interesting unexpected audiovisual materials for the scholar, also trade journals(p10-cd), or travel guides and written secondary sources(p13-h). One scholar closely follows its developments, since (s)he things there are things that you really could not see before, in the public domain and of course outside the canon(p9-a). Archive.org it's nice to get legal copies of the material(p9-a).
- Gallica, the digital library of the French National library for trade journals and other journals related to the topic under investigation(p10-cd).
- One scholar uses Ebay for accessing images of cover pages of magazines that are on sale(p8-h).
- Scholars in the social media history research perspective rely on all sorts of systems, for instance, population statistics services such as the "Central Bureau voor de Statistiek" (CBS) in the Netherlands(p8-h).
- The Digital Public Library of America, as a source for images(p11-cd).
- Worldcat to download bibliographic data into a reference management system(p11-cd).

(5) Film/video streaming services. The use of film/video streaming on-demand services such as Netflix is not common among the interviewed scholars. Only a few of them use it for entertainment and/or for keeping up to date on new television formats (also when video quality is important)(p6-a). One scholar commented that (s)he may watch films on Netflix, with

a conscious intention of observing how its recommendation system works(p4-h). Only one scholar uses one similar service for teaching purposes, "Videoland.nl" (for Dutch films), even though (s)he recognizes the problem of finding only mainstream works there, not "older" or rare films(p2-e). One important issue raised by this scholar is that the information about the films offered by these providers may not be reliable, and (s)he should not be cited. Instead, for information about the films, the use of encyclopedias or the Eye film museum website is more reliable(p2-e).

Finally, even though the use of movie clips is an essential part of the scholar's work, clip repositories such as "Movie clips" don't seem to get acceptance among them, one participant commented the problems in the way clips are cut which seems random (comparing it to literature, it would be like having a fragment cut in the middle of a sentence)(p5-a), even though they sometimes have a better selection, or clips that you don't find in YouTube(p5-a), or more complete access through keywords(p1-a).

As a final point of this section on information systems, it is important to remark that due to the extensive variety of sources used by film scholars, the interconnections between the different types of materials become an issue. However, even though scholars may see the need to be able to connect different secondary sources and related materials to the original source (e.g., all the documentation available on the Eichmann's case to the actual broadcast recording)(p4-h), or the blog posts (textual sources) about selected YouTube videos(p6-a), one scholar critically points out to the issue that there is no ideal system that can do this merging. It is what the students have to learn and what the scholar does permanently, combining their knowledge with information from different sources(p5-a). The way sources are put online and contextualized can help researchers in their task of connecting and cross validating. Also, in relation to the essential task of building a corpus, one scholar suggested that system support would be valuable (for instance in YouTube), by helping in keeping track of searches and/or things that have been found(p6-a). This is an illustration of the need for personal annotations (e.g., marginalia, bookmarking) during information seeking and search. This functionality is apparently essential during the task of building a corpus, and a real need in the current landscape of information overload: "I would love to have a system where I could organize the viewing patterns for myself or store everything interesting that I find in a more structured way"(p6-a). Perhaps the software for qualitative analysis that was mentioned in Chapter 4 could have helped this researcher, but also the way sources are presented online. Likewise, personal or social annotation support could facilitate the aforementioned task.

7.6.4.8.Selecting relevant sources, and the known items search dilemma

During the several search activities for moving images performed in different information systems during the interview, the participants were requested to explain why they would select certain results and not others. Although it is not possible to draw precise conclusions about relevance criteria based on this open task, it could be noticed that the interviewees frequently direct their attention to any provided information related to the identification or

historical information about the individual media items (i.e., data about creators, dates, countries of origin, etc.).

Indeed, **support for known item search** is what scholars mostly expect from information systems, mainly in the case of film archives catalogs(p14-a). To illustrate this preference, when asked about the ideal online system for her/his research, a scholar with an aesthetic/narratological focus said: "the ideal system would provide access to the [film archives] catalogs, and through them, to clips or films that have been digitized"(p1-a). This shows the main needs or wishes of scholars in this group: film identification (which is the first, most essential way of access to date provided by an archive catalog), and online availability. A scholar from Study B emphasized that this type of search for known items is the key type that archives should support:

> "Right now I am trying to find very specific films, but I cannot watch them, the film archive says 'we have them in celluloid' but it's not possible to watch them', and in many other cases you cannot know if a film archive has a copy or not, this information is not available, so I think that a website that could provide this information, put order to what is already available online and give copyright information, would be a treasury" (SB,p1).

Indeed, even though the existence of identification or historical information may be taken for granted, one common complaint by the scholars who focus on non-contemporary movies was the lack of availability of this information. This may be partially due to the fact that not all film archives have a public online catalog, and/or to their prevention to disclose what their holdings are. Additionally, there are many films that are not identified because of lack of information (this is an intensive curatorial work, as it will be described in §8.4). Also, this type of information is scarcer in the case of online content, and scholars seem to be more aware of the need for it. This strong need for known item search support within IR systems has historical reasons rooted in archival practices, as clearly explained by Leigh (2006):

> "Traditionally, the choice in cataloging moving images has been at the item level, as description favors completed moving image works where titles and credits are transcribed from the film itself. This approach is borrowed from item-level descriptive practices common in libraries". (Leigh, 2006)

Indeed, previous research (Wiberley, 1983) about the terms used by humanities scholars during their searches in databases, found that "almost sixty percent of those terms were names of people (e.g., Charles Dickens) or single creative works (e.g., A Tale of Two Cities)". This study recommended to improve system support based on the idea that "precise terms describe much of what interest humanists", and that these "very precise and easily indexed" features facilitate the creation of effective information retrieval systems. Although this conception prevails in subsequent research, current system design attempts supporting users in their tasks by improving exploratory search, going beyond simple lookup tasks to facilitating "symbiotic human-machine relationships that provide guidance in exploring unfamiliar information landscapes" (White & Roth, 2009).

In any case, subject access in the humanities is problematic. Indeed Tibbo (1994) identified several challenges in relation to this issue, the main two are: “the semantic heterogeneity and less structure nature of humanistic literature”, and “the interdisciplinary and unique research interests of humanistic scholars”.

One suggestion to solve the problems of moving image access and to the sources that support their discovery comes from the information professionals’ community: Leigh (2006), suggests that the aforementioned “reconceptualization of this strict item level approach” could be achieved by providing different ways of organization, by grouping different items, keeping a higher consistency between materials through describing “ideational” or conceptually-based collections instead of that of individual items based on physical properties. Specifications such as the Functional Requirements for Bibliographic Records (FRBR) describe practical ways of undertaking these new ways of description (see Chapter 2, §2.4). Other researchers point to the fact that the lack of knowledge about how primary sources are used by humanists is the source of deficiencies in the theory and models proposed for doing archival research. This is the case of Yakel & Torres (2003, as cited in Yakel, 2005), who propose a model towards understanding the use of primary sources, “focusing on archival information literacy”.

These suggested changes in direction from archival practices were not yet evident during the time of this study, and thus it is not possible to judge whether scholars would be open to different ways of presentation of the archives holdings, or to other ways of discovering new items for research that deviate from the more traditional scholarly practices described before (§7.6.3).

However, in any case, for any IR system mechanism or archival norm to succeed in increasing the degree of openness from the scholars to source discovery based on other principles than the “know items”, there must be a high degree of contextual information about any source that is presented online (e.g., descriptive, provenance, and historical information, and connections to other items in an eventual grouping through a collection instead of individual items, as suggested by Leigh, 2006).

This is because the first thing that a film scholar will try to do when facing an unknown source is to place it historically $_{(SB,p1)}$. For this reason, this contextual information must be of good quality and, hopefully, validated by experts in the field$_{(p4\text{-}h)}$. One participant comments:

“Web-content done systematically by experts (from academic scholars to well self-educated amateurs/collectors) or by institutions (such as archives or film institutes) is basically a good thing”$_{(p9\text{-}a)}$.

When asked about the most important values of a web service, a scholar from the aesthetic/narratological perspective replied: “The most common way of using websites of archives and archive-related sites is to get historiographically valid data on films and people involved in films. The more historic details on every work and/or person are listed, the more useful is a system for me”$_{(p9\text{-}a)}$. Likewise, a scholar emphasized that for her/him finding things

is not a problem, but getting information about what (s)he finds: “For me it is not so much about tags, or to find stuff more easily, it is more about having more context information”(p4-h).

Additionally, for known-topic related searches, which use topic or content-related keywords, information systems support the task by offering options to filter by production year or creation dates. Indeed, production dates or periods are usually used as search filters(p4-h;p11-cd), but this is hardly achievable on video sharing websites, when it is even mixed with the date of upload(p1-a).

Besides isness* related metadata, one of the most informative elements in what relates to items discovery are synopses, followed by critiques or reviews (SB,p1), or comments in the case of online sharing platforms (SB,p1). Indeed, detailed content descriptions or synopses may be more valued when the researcher is the item discovery phase, looking for “undiscovered” media works, or for objects, persons, motifs, themes or subjects. As it was observed in Chapter 6, the form of these annotations can vary from plot synopses to complete reviews. In the current study, the preferred types of open annotations were not evaluated. In relation to historians, there is evidence that: “effective reviews are more useful than abstracts because they provide a framework within which the likely quality and relevance of an item can be judged.” (Stone, 1982)

Not finding content descriptions may represent a significant problem for the researcher, adding barriers to her/his selection process(p6-a). Content descriptions may also help in overcoming language barriers when the scholar cannot understand what is actually being said in the moving image(p4-h). Also, even though the scholar hardly performs a topic based search in an information retrieval system, topic and genre information is expected to be there(p10-cd).

In the previous cases, the scholars were referring to contextual information as the identification and historical details of the media works. In the social media history focus, another type of contextual information (i.e., data about the production and circulation of a moving image source) is their *raison d'être:*

> “I am looking for most things that are mostly not moving images (business, locations, suiting capacities of theaters, prices...) then I want to have facts, evidence, but moving images are not the best sources to get this kind of information, almost everything is contextual, not the film text.”(p2-e).

As an additional criterion for using an online moving image as a research source, scholars also may look for clear copyright notices(p13-h).

7.6.4.9.Semantic attributes for moving image search, and attitudes towards using (socially generated) keywords, tags, and time-based annotations

Something that was clearly observed in the study is that scholars do not search for moving images by content or stylistic features, but for the items that they know in advance will be relevant for that type of need (known item search). Next, there is a brief report on some of

the participants' comments when they were presented with a list of semantic categories that they could eventually use for searching moving images if this was possible or desirable for them. These categories (*"cinematography"*, *"emotions"*, "explanations", "facts", "other"[170]) were used in Study A for providing guidelines to users entering tags in a video labeling game, and for the analysis of their tags (see Chapter 5, §5.4.7, and Appendix J, Part 7).

Most scholars found these categories interesting and considered them relevant at some point in their analysis, but they would not necessarily use those keywords as search terms: "All these themes may pop up in some context in which they become relevant"$_{(p2\text{-}e)}$; "I always work with a certain idea, would not look for a film where someone is 'crucified', I already know this"$_{(p5\text{-}a)}$.

When they reflect on whether there would be possible to search using keywords from those categories, they only see it possible for *"Facts"* and *"Cinematography"*: "I mostly use facts and cinematography, because for [my topic] it is exactly this combination: what I can see in the image but with a combination of a cinematographic style. The other two are not relevant."$_{(p14\text{-}a)}$. But it also depends on the type of work. A scholar from the aesthetic/narratological perspective clarified: "if I do a narratological analysis, I will use emotions, but if I do a more historical analysis, I will use facts. The kinds of analysis I am doing are not usually about symbolic issues ("Explanations")"$_{(p1\text{-}a)}$. Scholars may make a distinction between categories that are used for searching and categories that are used for analysis: "my work is to look for "Explanations", then it could be interesting what people intuitively find important, but this is less valuable for me" $_{(SB,p1)}$.

Cinematographic keywords are not conceivable to be used for search, "only perhaps, color"$_{(p10\text{-}cd)}$ one scholar said. On the contrary, these terms are highly used during the analysis stages (for example in the case of formal analyses described before, §7.5.3). If scholars have to find sources based on cinematographic aspects, they will not probably use an information system for it: "I rather would look for examples I have in my mind than rather look in a clip database"$_{(p1\text{-}a)}$; : "I don't look for 'high angles', I have a repertoire in my head"$_{(p5\text{-}a)}$. Very rarely these terms may be used to find example scenes for teaching purposes, indeed, only one case was found in the group of interviewees. A scholar from the epistemological research perspective searching for 'parallel montage' + 'Silence of the lambs' since he already knew there was a scene in that movie that he could use for exemplifying that technique$_{(p8\text{-}h)}$.

Usually, cinematographic aspects can be connected to facts and emotions of the characters$_{(p12\text{-}a)}$. Additionally to the factors included in the questionnaire, keywords in this category may include mise-en-scene, costumes, tricks$_{(p1\text{-}a)}$.

While the scholars would perhaps consider possible to search for *"Facts"* (narratological facts one scholar clarified$_{(p10\text{-}cd)}$, they said they would never search for *"Emotions"*: "certainly not emotions" was a common answer$_{(p4\text{-}h;p11\text{-}cd)}$. A scholar explained: "emotions could be interesting, but you start with your topic and then you see if it is connected to a kind of

[170] These categories have been used in Study A. See Chapter 5 (§5.3.5 and §5.4.4).

emotion, and not the other way around"(p10-cd).

> "We were looking a couple of weeks ago on screenings in Dutch theaters of exploitation films, and that brings questions about how they were advertised, the kind of emotions that these images try to trigger, that may come into play, but it is not something that I systematically work on or do research on."(p2-e)

One scholar who wrote an article in which (s)he reflected on emotion-related aspects, commented:

> "but this is something I don't want to see, I don't want to be able to search, otherwise, imagine there would be something like 'witness crying', and I would find that really disgusting if I can click on, I don't want to see other witnesses crying, this is something personal […] or even someone saying: "this footage makes me cry and if you also want to cry click here" […] I am very critical of the display of emotions in this type of films"(p4-h).

The same situation occurs with "Explanations". They may be used in the form of keywords in a known topic search (e.g., "psychotic"(p10-cd)), but most scholars do not see logic in searching for them, since this is the work of the scholar, to build those explanations (SB,p1): "A system doing this? [(s)he meant searching for "Explanations"], I would like to see how this works, I am skeptical but interested, not sure if agreeing on whether this is helpful"(p6-a); "Explanations... I would not use that for searching, this is another level"(p14-a); "I don't work with allegoric images, so I don't search for explanations"(p11-cd). Scholars in the philosophical/ontological perspective may use abstract concepts (e.g., 'interactivity') in their searches(p2-e).

One reason that may explain the lack of trust in keywords of the type "Explanation" or *"Cinematography"* is their provenance: "I would not search for a stylistic feature [or an explanation] since I would not trust the way it was indexed"(p2-e); the same in the case of "Explanations" since "they may be the interpretation of somebody else"(p4-h). Other types of keywords, for instance, Factual (e.g., scenarios) could be trusted, but always double checked(p11-cd). This connects to the issue of domain expert tags and trust in socially generated annotations.

The use of socially generated tags and/or other types of annotations was discussed during the interview while the participants performed their searches (i.e. in Part 6-7, Appendix J). Since most scholars base their queries on isness metadata*, they said not to pay much attention to them(p4-h;p8-h), or not to see a logic in them, or that they lead to uninteresting things(p4-h). One television scholar highlighted positive aspects of tags at a practical level since they helped her/him to actually locate related materials when browsing(p6-a). However, this scholar added: but they do not help at a conceptual level since, there is always the question on who categorizes. The problem that the scholar was referring to is actually of an epistemological focus, related to the provenance of the annotations that provide or impede access to the media works and/or facilitate their discovery.

In this sense, scholars may be open to user-generated content, but only to content that

meets the requirement of being filtered through expert curation(p2-e). Young scholars are more open to both curated and non-curated online content, but seek for complementarity:

> "On the one hand side, I wouldn't trust user-generated content as much as content generated by professionals and the 'real' experts. However, on the other hand, it is amazing what information and content you can find online that is generated by, e.g., film geeks, etc. Sometimes, it can also be very refreshing and point to other directions you would normally never think about. But I still see online content different from content provided by the experts and professionals in the archives. For me, it must be a combination. User-created content doesn't replace a couple of other content categories that should still be provided by audiovisual experts. (I'm talking here both as scholar and archivist.)"(p14-a)

Some participants were asked for an opinion about "**IMDB plot keywords**". These, as it was commented before (§2.6) are user-generated annotations that are attached to a specific movie in this database. Most participants did not know about them though but were given some time to explore them (using a specific movie title of their choice). After occasional initial enthusiasm or curiosity for such a feature, they said to discover that they were not totally useful. For instance, after searching for the plot keywords of Hitchcock's "Vertigo", a scholar found the keyword 'hair' and asked: "what could you do with this? […] maybe [the user] was just trying to be smart […] they don't think at the broader level"(p10-cd). Another participant commented: "those keywords are not too handy […] you get swamp, and you already have to know to be able to judge"(p5-a). Others were not negative, and indicated that these keywords could be useful as starting points(p9-a), perhaps for browsing, or for ideas for creating a program for a film cycle based on themes(p13-h). But most scholars consider the IMDB plot keywords "too pseudo-specific"(p9-a) and inconsistent(p13-h), which presents a significant limitation for systematic research.

When asked about the possible benefits of **socially created time-based annotations** for searching content within specific scenes (see §4.7.3), scholars were mostly skeptical. After showing examples from Geisler's (2014)[171] detailed time-based description, one participant suggested that this has to be implemented first and then see in ten years if it reported benefits(p12-a). One participant commented: "in the case of Hitchcock's "Vertigo" it could help, but in the case of "Twin peaks", I don't know why I would like to find the scenes where the doughnuts are in the evidence room…"(p4-h). This conclusion agrees with a previous study presented in this thesis (Chapter 5), in which film experts and scholars did not see how factual or ofness time-based tags could support their research.

Some participants agreed in that one possible use of these socially generated time-based annotations could be for teaching, for instance, in helping to find specific fragments within a movie ("that you already know of")(p1-a;p11-cd), or in finding more examples to show in class(p4-h;p10-cd).

[171] Appendix J (Part 7). We thank author Gary Geisler for facilitating the examples (personal communication, February 15, 2014).

Time-based shared annotations also could be eventually useful as the first step in interpretation, although film scholars believe that automatic tools cannot replace the task of the scholar in interpreting the data her/himself(p11-cd)[172].

However, these somehow general negative attitudes towards user generated tags are not due to these indexing techniques themselves(p5-a), but to the way these annotations are produced and controlled. Indeed, one scholar explained:

> "I think they [keywords] are absolutely useful […] in many cases, people may watch "My life without me" without tagging somewhere 'recorded farewell', this is a problem that tagging is not necessarily allowing a very systematic kind of research, whereas you can have a list of all films produced by a company or filmmaker, or where an actor features, etc., so you get relatively complete filmographic lists"(p1-a).

Indeed, a search for the IMDB plot keywords for that movie includes one keyword that could be relevant: 'taped letter'. However, when clicking on it, there are only three film titles that were judged as uninteresting results by the participant. Similarly, another scholar commented during a similar task: "when it gets interesting, there is nothing!"(p5-a).

The problem, two scholars clearly explain, is that these keywords may be either too broad or too random or arbitrary: too broad in the sense that they are not attached to content that is relevant (e.g., where the keyword 'diary' points to moving images where diaries are meaningfully related to the content of the video (the participant talks about "categories"), and not where every diary is being shown)(p6-a); or where a television appears in an image but playing a role "plot wise" or "set wise" or when it is talked about, not when it is just there for a few seconds(p7-e). This kind of distinction is, the participant says, "the holy grail of Google as well"(p7-e). And tags are too random because there is no consistent way to explain why certain keywords are assigned(p6-a), or to explain who created them(p4-h).

On the other hand, the great amount of keywords that can exist in sites such as IMDB makes it problematic since having a long list of results creates a false idea of exhaustivity(p1-a) but there is no way to sort them or to refine them for working systematically with them(p5-a). A scholar with an epistemological focus actually thinks that even though user participation seems to be a kind of "liberating possibility", "filters are useful, filters are what make the archive, the collection relevant to us"(p2-e).

7.7. Summary, conclusions and future work

As it was described in the introductory chapter (see §1.6), the study presented in this chapter was guided by the following general research question:

RQ3. *How do film and media scholars seek and search moving images? What are the most prominent information needs, seeking and searching processes, and what types of*

[172] For more issues of shot-by-shot analysis as a form of annotation see §7.5.2.

annotations support them while seeking moving images for research-related tasks?

The broad conclusions and implications related to that question are presented in Chapter 8 (s.9.3.2). Next, the findings of this case study are summarized by each specific research question. Please note that the general term 'film and media scholars' refers to this particularly studied group of scholars (see Chapter 4 for a description of methodological issues related to case studies):

RQ3.1. *What are the most significant characteristics of the film and media scholars' research areas and research behavior in relation to topic selection?*

Conc. C.1. Film and media scholars have a wide variety of **topics and "research questions"**. Findings in this regard coincide with previous studies about IB of humanities scholars, which show that in this domain individual viewpoints are valued, as well as having an individual distinctive topic. Research topics originate: (1) from "personal fascinations", (2) from the framework of broader projects, or (3) from specific archival collections, which need to be interpreted and understood from a scholarship perspective.

Conc. C.2. From an IB perspective, the variety of topics can be grouped into more general **research focuses**, which partially corresponds to research perspectives of film and media scholarship identified by historiographers. These focuses are: (1) aesthetic/narratological (in which the center are the individual media works), (2) cultural/documental (in which the interest is on the represented/documented realities, or in media as evidence for social and cultural history), (3) social media history (where the center is the production, exhibition and reception context of the media), (4) epistemological (when the interest of the scholar is on the media or the discipline as a cultural phenomenon), and (5) data-driven focus (when scholars are interested in exploring emergent research questions enabled by structured and massive data extraction from image content and contextual historical data).

RQ3.2. *What kinds of sources are used by film and media scholars and what are the most significant characteristics their methods for collecting and analyzing them?*

Conc. C.3. Even though it is logical to think that moving images are the **primary source*** for all film and media scholars, this is not equally true for each of the five research focuses identified before. Differently than the other groups, social media historians do not study the intrinsic aspects of the moving images, but other primary sources that provide answers to their questions about the history of cinema-going or other historical or contextual information (e.g., newspapers, theater programs, demographic information, maps, production or exhibition company records, etc)[173]. It does not mean that the use of these materials as well

[173] During the time this thesis was written a debate was starting to emerge about the tension between the importance of individual films in the study of cinema-going. A presentation entitled "The individual Film in Cinema History: Does It Matter?" by Kessler and Lenk (2015) deals with these issues. The presenters ask themselves:
"However, when we see Cinema History as an important strand of research within Film Studies (or Cinema Studies, depending on the terminology used), why shouldn't its results feed back into other areas that constitute our field, such as the study of individual films? And on the other hand, even if the experience of moviegoing goes beyond watching a

as of other **secondary sources** (e.g., as books and journals) are exclusively used for this group of scholars. Contrarily, they are an essential support for film and media scholars regardless of the focus. Indeed, seeking moving images or information about or around them is often mediated and supported, or even subsequent to knowledge acquisition from secondary sources. This case is similar to music scholars, for whom Brown (2002) found that listening to music was an important component of music research, as important as the use of monographs. Accordingly, previous findings related to art historians indicate that for art history methodology to succeed, **a link between images and textual materials** had to exist (Layne, 1994)[174]. This also applies to the studied group of film and media scholars. Turner (2009) has reached similar conclusions when he indicates that:

> "Although a great deal of research in automating the indexing process using low-level approaches is being conducted in the field of computer science, the relationship between text and image is an essential one that will persist." (Turner, 2009).

Conc. C.4. Information systems that support finding and discovering media works should mine and connect not only to textual documents that are generated during pre-production, production and post-production (as Turner et al, 2002), but also to the paratexts that are linked to specific media works. This is part of a basic requirement of providing necessary "scholarly-based links between texts and images" (Winget, 2009).

Conc. C.5. There is also a benefit to information-annotating activities when these connections are provided and integrated in information processing systems. An example is the functionality suggested by Dijkshoorn, Oosterman, Aroyo, & Houben (2012) in providing supportive textual information during the process of annotating images.

Conc. C.6. The process of **building a corpus,** i.e., a collection of media works and/or of information or data about or around them, is a key activity of film scholarship regardless of the research focus. Most scholars from different perspectives select specific sources to investigate and/or to support their research in a purposeful way based on their personal criteria. With certain variations depending on the research focus, rather than striving for exhaustively analyze all media works that could be relevant to a research question, the film and media scholar selects exemplary works or scenes based on significance. However, due to emergent possibilities brought about by data-driven research, scholars may start trying to go about very systematically.

Conc. C.7. Film and media scholars are all capable of performing formal **analysis** (e.g., shot-by-shot analysis) on the moving images. However, formal analysis is mostly performed by

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particular film, does that mean that films do not matter?" (Kessler & Lenk, 2015).

[174] A study by Bates (2001) about the information needs and seeking of scholars and artists in relation to multimedia* materials found that art history scholars usually have "non-image" related needs. Bates explains: "they do a lot of browsing, particularly for images (and not just "art book" images), but often have quite specific verbal (non-image) information needs too. Thus both browsing and directed search are heavily used search strategies. Their information needs are very wide-ranging and go well beyond arts information. One study found that only one quarter of art student information requests were satisfied by arts-related material" (Toyne, 1975, as cited in Bates, 2001).

scholars with an aesthetic/narratological focus. To a lesser extent, scholars with a cultural/documental or epistemological focus also perform this type of analysis. In general, the studied group of film and media scholars analyses their sources (not only moving images) in an hermeneutic way (Day, 2014a, p. 23). This means that the scholars do not perform "surface" reading of their selected sources, consisting on skimming texts in order to answer information needs (Day, 2014a, p. 12). Film and media scholars seem to be reluctant to depend on IR systems or any other information organization system that "does the work for them"$_{(p7\text{-}e)}$.

Conc. C.8. In relation to Conc. C.6, key **research skills** of film and media scholars include self-awareness and high-level individual judgment capacity in selecting and interpreting their sources. This reflects one of the fundamental differences between humanities scholars and scientists, who seek for discovery and explanation rather than understanding and interpretation (Fry & Talja, 2007).

RQ3.3. *What are the most significant characteristics of film scholars' information needs and seeking processes for moving images in relation to their research and teaching tasks?*

Conc. C.9. There is no single way of characterizing the information needs and seeking strategies of film and media scholars. These change dynamically among scholars and for the same scholar depending on the research project. Seeking (sources or information) is intrinsically connected, and could be even considered as a synonym of the research process. However, commonalities seem to emerge from the previously identified research focuses (Conc. C.2), which facilitate the understanding of the different information needs and sources required in each case. In this sense, a study of the film and media scholars' information behavior implies a study of the scholars "**research behavior**" (as named by Bates, 2001).

Conc. C.10. Film and media scholars' **information needs** change depending on the research focus (Conc. C.9). However, general characteristics can be broadly summarized in four aspects. Some of them coincide with the information needs of media and communication students and scholars, by Kirkegaard and Borlund (2008), whose findings are indicated in parenthesis:

(1). Need for each media object's identification (the media as data objects for analysis).
(2). Need for access to the actual media object ("archival dimension").
(3). Need for identification of the contents of different media objects, which occur at different levels (e.g., complete media work, fragments, or specific objects).
(4). Need for contextual information about the production, distribution, exhibition and reception of the media objects ("transmission dimension" and "reception dimension").

Conc. C.11. The need for **media object's identification** (e.g., title, director or year of production, which correspond to the "issness*" metadata) is basic to film and media scholarship, regardless of the research focus. For scholars with an aesthetic/narratological focus, being a scholar means having the knowledge and skills to be able to identify specific

media works. This corresponds with the prevalence of known-item needs while searching ((a)). This indicates that film or media identification is the first form of access, even if the source itself is not accessible ("archival dimension").

Conc. C.12. Media works are not equally used as **objects of analysis**. The extent to which media works are considered objects of analysis changes clearly at least in two research focuses: (1) scholars with an aesthetic/narratological focus seek moving images as objects ("object pole", according to Fidel, 1997); and (2) scholars with a cultural/documental focus seek moving images for the information which the images include (the "data pole" according to Fidel, 1997). As Fidel also found, the property of being retrieved as a source of information, or as an object, is not inherent in the images themselves, and the same image can be used as a source of data by one user and as an object by another. Scholars with a social media history focus seek data about the production, exhibition and reception of the media works, thus represent a different "pole". This corresponds with the "transmission and reception" dimensions, as called by Kirkegaard and Borlund (2008).

Conc. C.13. Access to the actual moving image sources ("archival dimension" in Kirkegaard and Borlund's terms) is fundamental, although to a different extent, for scholars in the aesthetic/narratological, cultural/documental and epistemological research perspectives. That is, it is essential for researchers with these focuses actually to have the possibility to watch films and media. Contrarily, social media historians may not need to watch the films and media, or if they do, it will be with a clear purpose of "extracting" information about the production or exhibition context.

Conc. C.14. Consequently with Conc. C.12, **Identification of the contents** of different media objects is required at different levels depending on the research focus, but also on the research questions. For scholars with an aesthetic/narratological focus, identification of the complete media work (at the item level, as shown in Figure 2.1) seems to suffice, even though ocassionally they may wish to find specific objects (e.g., telephones) for studies about motifs. For scholars with a cultural/documental focus identification of specific fragments or objects is desirable. But the need for "random access to the content" of the audiovisual sources (and thus for shot-level indexing) advocated by Auffret and Prié (1999) does not seem to be a priority for all groups of film and media scholars. In the case this was needed, it would be more important for scholars with a cultural/documental focus than for the other research focuses.

Conc. C.15. The main **types of information needs** identified in the studied group of film and media scholars are known item, muddled item, known and muddled data elements, factual data, and known topic. These findings coincide with those of Kirkegaard and Borlund's (2008) investigation of Media Studies students and scholars: known item, factual data, known topic, and muddled topic. The differences in the findings between the two studies rely in the scope of the definition of "muddled item" and "muddled topic" needs, which were discussed in this chapter. However, the findings are highly similar despite the differences in terminology.

(a) Accordingly with Conc. C.11, **known-item related needs** seem to prevail. However, this is mostly valid for searching behavior (i.e., through the use of IR systems, Conc. C.21), but not necessarily to seeking behavior. In other words, the types of needs are not always item-related during all seeking or research processes: i.e., the scholars may start with a known topic, not knowing which items are significant, and lately get to "know the items" (i.e., the individual media works and/or the relevant sources about them). This happens by means of a combination of strategies, such as previous knowledge, close readings of selected sources, footnote and reference chaining, conference participation and academic networks. In that sense, research or seeking processes which started with muddled or known topic related needs, may transform into known-item related needs as the research progresses.

(b) **Muddled item related needs** mostly occur when the scholar needs to define the identity of new media items or identify new items based on the characteristics of pre-existing media. In Kirkegaard and Borlund (2008) this is not called "muddled item", but "identification of borderline exemplars."

(c) **Known topic related needs** occur to a different extent among film and media scholars regardless of their research focus. This type of need consists of locating either items or information about or around the items, based on preliminary information around their subject or content characteristics, as well as of contextual elements. The nature of topic-based needs changes depending on the research focus: for instance, in the aesthetical/narratological and cultural/documental focuses it relates to different types of motifs and themes; in the social media history focus it relates to institutions, time periods, geographic locations, or population segments; and in the epistemological focus topics may be broader subjects or problematic issues.

(d) **Known topic-related needs** are more common among scholars with a cultural/documentary focus. Findings in other related domains may point to a common search pattern among (re)search with a cultural/documental focus; for instance, Inskip et al., (2008) found that users rarely search for works by named artists or titles, but focus instead on genre, periods, affective facets, and formal characteristics.

(e) **Muddled topic related needs** occur to a very small extent in the group of interviewed scholars. These needs occur when a person does not exactly know what (s)he is looking for. The reasons may be in the fact that the interviewed scholars are experienced or, in the case of the Ph.D.s, their research originated in the context of broader projects which had topics already defined. There is a difference in the concept of "muddled topic" need in relation to Kirkegaard and Borlund's study, where they are described as the needs to get an overview of transmitted broadcast (in a given system). In the study presented here this is defined as "known topic" need, which do occur in the group of interviewees ((c)).

(f) **Known and muddled data element related needs**, as well as **factual data related needs** are essential for scholars with a social media history focus. This relates to the interest in

finding relations between entities (e.g., the number of spectators, production companies' names, programs, theaters' names and locations).

> **Conc. C.16.**The seeking behavior of film and media scholars resembles that of professionals working at ccultural heritage institutions found by Amin et al., 2008. The needs of both groups can be defined as complex tasks: "We find that indeed Needs are not always seen as well-defined and topical, but may be complex, muddled, verificative; and problem-based rather than topical." (Järvelin and Ingwersen, 2011)

Conc. C.17. One of the most important information **seeking strategies**, after the use of secondary sources and textual information mentioned in Conc. C.3, is the trust in the scholars' own memory, as well as relying on community support (asking colleagues). A good memory was already identified as one characteristic of art historians (Brilliant, 1998).

RQ3.4. *Are there particular patterns in film scholars' search behavior? What kind of information systems do they use, and how?*

Conc. C.18. A common characteristic of scholars with a cultural/documental focus and the social media historians is the need to use **different kinds of information systems** (from an institutional point of view) as well as IR systems.

Conc. C.19. The use of **general web search engines** (e.g., Google) is generalized among film and media scholars, as it is also the case among other groups of humanities scholars (Kemman et al., 2013). There are five main reasons for this extended use among the studied group: (1) Lookup and access to known sources (related to known-item search); (2) Defined "exploratory browsing" (related to known topic search); (3) "Focused search" (related to muddled-item needs, or identification of media works; (4) Entry to other information systems; and (5) Support services (e.g., translations). There does not seem to be (yet) a significant exposure to supposed biased algorithms (the "black boxed algorithms" effect proposed by Kemman et al.), since film and media scholars hardly perform vaguely defined searches, which are related to muddled-item needs (or "exploratory search) in which there is no clear purpose (Conc. C.15(e)). In that sense, even though there is no evidence from the current study to validate Kemman et al.' conclusions, their work may be taken as a call for awareness of the daily practice of the film scholar in line with current discussions of source criticism in the context of the digital humanities.

Conc. C.20. Changes in film and media scholarship may be produced, rather than from the "black box effect" of search engines proposed by Kemman et al., by an extended use of low-quality moving image reproductions and incomplete source information in educational settings. Indeed, searching behavior for teaching purposes seems to be different than for research purposes. In these cases, the film and media scholar seems to be more flexible to issues associated with provenance and source quality for illustration purposes, which is evidenced by the generalized use of video-sharing platforms such as YouTube. Further research is needed to understand how the use of digital low-quality versions and lack of

source information is affecting the work of the film and media scholars as educators, and how they transfer to their students skills such as source criticism, developed after long-term acquaintance with more rigorous methods of research. Studies in the area of "edition literacy" done in the music domain (Scott, 2013) may be complementary.

Conc. C.21. The reason why most scholars claim to "search for information they already know" may be found in the differences between seeking and searching. There seems to be evidence that known-item related needs, that is, for specific information objects or passages, occur mostly while searching (i.e., when querying an IR system), while seeking is performed to several other strategies, both online and offline ((a); Conc. C.16).

Conc. C.22. Even though it does not seem to be common to use information systems for exploratory search (associated to muddled topic requests, i.e., not knowing exactly what to look for), **exploratory browsing** does occur, but in the boundaries of specific information systems, such as a concrete digital library or media archive.

Conc. C.23. For the most part, access to **specific scenes** is not mediated by IR systems. Film and media scholars rarely use IR systems for searching fragments based on their content characteristics (bottom-up). Instead, they claim to have "mental repertoires" of media works or scenes that represent specific movements or styles. Seeking for scenes is often done through personal memory and/or by asking colleagues (Conc. C.16). One of the reasons for the infrequent use of subject keywords related to known or topic searches mediated by information systems (e.g., 'labor movements'), is that the scholar may not know where those keywords come from, and that those keywords may have implicit meaning interpretations that the scholar needs to check or provide her/himself according to his/her own research questions.

Conc. C.24. Fry and Talja (2004) indicate the need to study specific domains rather than disciplines. In this thesis, several research focuses or perspectives were identified among film and media scholars (§7.6.1). From now on, it would be ideal to have more IB studies about each specific research focus, in order to understand the information needs of each specific group more in detail.

CHAPTER 8. Conclusions, Implications, and Future Work

"The basic premise is as follows: in the published book, the text, the narrative, the core of the work, does not stand alone. In fact, it cannot. An assemblage of other elements is required to make present the text, to render it apprehensible to the reader and suitable for both 'reception' and 'consumption'." (Genette, 1997, as cited in Desrochers & Apollon, 2014, p. xxix)

8.1. Chapter overview

This final chapter[175] attempts to analyze the most significant conclusions of the research presented until this point. It also provides the most salient implications that this gained understanding has on the main research problem, which is related to the need for investigating, from an IB perspective, the emergent initiative of *nichesourcing* in terms of its contributions to moving image annotation and access (§1.2).

Section 8.2 presents the general conclusions of each of the three research questions that guided this thesis work (Table 1.2), based on the findings of three separate but interconnected studies, which respective main conclusions are now connected. It finalizes by summarizing them in two main relevant aspects that have implications for research and practice in relation to the investigated problem.

Consequently, Sections 8.3 and 8.4 present a discussion of the implications for research, practice and theory derived from these conclusions. The discussion in this section is guided by the concepts proposed in the theoretical framework adopted for this thesis. The implications are discussed on two levels: with a focus on the practice and empirical research (§8.3), and with a focus on the theoretical consequences for IB theory and research (§8.4). The implications for *nichesourcing* initiatives observed at these levels are directed to two of the cognitive actors involved in the moving image annotating processes. Using the terminology of the IS&R framework (Chapter 3), these are: (1) the designers of interfaces and IT algorithms and standards; and (2) the selectors* (i.e., actors responsible for availability and access to information objects). Finally, Section 8.5 summarizes the ideas for future work that were included in the context of each one of this thesis' studies and introduced alongside the implications discussed in this section.

8.2. Conclusions

Two main aspects of *nichesourcing* were investigated: the types of annotations that could be expected from niche groups; and the role of different (potentially *nichesourced*) annotations in supporting domain experts' research tasks. These two aspects were researched based on

[175] For abbreviations and cross-references used in this section, please refer to the "Writing Conventions" and "List of Abbreviations and Acronyms" sections of this thesis.

the basic assumption that a better understanding of people's information behavior can provide evidence for improving the design of information systems that are meant to support them, and for informing the creation of more adjusted information services to their needs. Given the complexities involved in implementing and researching about *nichesourcing*, it was necessary to approach this investigation through an encompassing theoretical framework.

The findings from Studies A *(RQ1)* and B *(RQ2)* provided evidence to confirm that there are several **types of annotations** that could be requested from film and media scholars when a *nichesourcing* initiative is created for annotating moving images. These possibilities include not only time-based tags or keywords at different levels of granularity, but also open texts (such as synopses of different types, or film reviews).

Study C *(RQ3)*, also confirmed that information-annotating activities (from personal to collective) are essential to the work of film and media scholars. That is, that in the discipline of film and media scholarship (as in the humanities in general), annotating media works is an essential part of the academic work, where scholars create a great variety of textual or multimedia annotations and also new derivative works that support their dissemination and circulation in society.

In relation to the **types of attributes in the scholars' contributed annotations**, the investigation of film experts and scholars' tagging behavior for moving images *(RQ1)* showed that when tagging is done in a time-based fashion, and in a video-labeling game setting, the types of tags contributed by the experts are very similar to that of domain novices. The similarity lies in that both groups assigned around the same number of tags, and preferred to assign *factual* tags (e.g. common names of objects or actions depicted in the images). Indeed, most of the *factual* tags used by domain experts and novices (when tagging the moving images in a time-based fashion) corresponded to the "ofness"* pre-iconographic level. This finding agrees with previous research that found that descriptions at the shot level mostly name objects, persons and events found in the shots rather than abstract notions. Despite the similarities between domain experts and novices in tagging moving images in a time-based fashion, two differences were observed: (1) Novices tended to use more emotional tags; and (2), as expected, film and media experts and scholars used domain-specific terms related to cinematographic aspects, which covered several different dimensions. Despite the fact that the cinematographic terms were varied in semantic scope, this type of tags were used to a much lower extent than the factual tags in Study A. Coincidentally, the use of "ofness", factual terms by film and media scholars was also the most frequent during the annotating task that did not specify any type of annotation in the task (Study B). However, in this case, the use of cinematographic elements was not as low when compared with the factual type, as it happened in the previous study.

The finding above indicates that domain experts, overall, use mostly **factual terms** for annotating moving images, both when using tags in a time-based fashion, but also at the fragment or movie levels during a more open annotating task. However, in Study B, the factual elements were embedded in longer sentences (in the case of open texts), together

with terms referring to cinematographic aspects or explanatory elements. The most significant finding is that the use of these domain-specific terms is apparently more common in these natural language representations than during tagging in a time-based fashion. In addition, in the second case (Study B), scholars selected to describe specific objects, people (characters) or events (i.e., the factual elements), depending on their significance or value within the sequence or movie being annotated, and not as a reaction of what they were seeing during the time-based annotation performed in Study A. This leads to conclude that, in the case of expert user annotations, the type of annotation may influence the frequency of use of the more domain-related types. We say "may," since the role of instructions, and research questions are perhaps more influential variables on the type of attributes that could be described, as will be discussed later.

In relation to the potential use that "ofness" (isolated) tags may have in research, the three studies indicated that most film and media scholars are concerned about the strength that **time-based tags** at this level may have for conveying richer semantic information of the content, meaning, value and/or context of the moving images required in their research. In the light of the studies' findings, this indexing level and annotation type seems to correspond mostly to the needs of stock shot libraries and broadcast archives, and it appears that it is a priority for supporting only a few research questions of film and media scholars' research areas.

In this regard, the findings of Study C indicated that there is no single way to characterize the strategies that film and media scholars have to **seek and search** for moving images. Finding or encountering their primary sources is usually linked to research questions that depend on different research focuses that exist in film and media scholarship. The focuses identified in Study C, confirmed also by findings of Study B, were: (1) aesthetic/narratological (in which the centers are the individual media works); (2) cultural/documental (in which the interest is on the represented/documented realities, or in media as evidence for social and cultural history); (3) social media history (where the center is the production, exhibition and reception context of the media); (4) epistemological (where the interest of the scholar is in the media or the discipline as a cultural phenomenon). Any of this perspectives may have a data-driven focus (when scholars are interested in exploring emergent research questions enabled by structured and massive data extraction from image content and contextual historical data.)

The needs for different **access levels** to the moving images certainly depend on these research foci. In this regard, the main conclusion is that not all film and media scholars see an urgent need for time-based, "ofness" level annotations in their research, mainly if those annotations are done through isolated tags not contextualized into broader sentences or texts, where it is possible to observe the context and function of an "ofness" element in relation to other semantic elements. Nevertheless, time-based annotations, besides commercial or media production uses (i.e., footage retrieval), may support specific types of research focuses and questions in film and media scholarship, as well as outside this domain. Indeed, these time-based annotations are mostly needed by scholars with a

cultural/documental research focus, and with an aesthetic focus only in certain cases, especially for motif or themes'-based studies, when there is a need to find specific objects or events.

For all types of access, including access at the shot level, Study C also showed that media-related materials and documentation, as well as secondary sources, are an essential support for finding moving images for all film and media scholars regardless of their focus, and most of the time they are the main access strategy to moving image content. This need of **textual support** for finding the "content" of the images is equivalent to other findings in the domain of visual scholarship. Hence, besides the primary objects (the movies/films themselves), these textual sources play a key role in knowledge construction in film and media research. Magazines, books, newspapers, ephemera, graphics and all kinds of advertisement materials support scholars' reconstruction of the life of a film, from its conception to its production and circulation, until finally becoming part of critical discourses. This finding applies to all the research perspectives found in film and media scholarship (§7.6.1).

If textual support is the most important requirement during image seeking (Study C), an essential requirement for an information-annotating task is to have **guidelines**. Indeed, one of the most salient characteristics of the scholars' information-annotating behavior of moving images is the need for guidelines. Study A showed that most participants in a moving image tagging task in a time-based fashion need clear instructions about the type of tags that they are expected to contribute. Those instructions should help participants focus on specific aspects of the moving images since these can be numerous. In the event that domain experts in the film and media domain participate in tagging activities at a time-based level, guidelines for moving image content annotation at a semantic level would have to be provided. In general, instructions or guidelines were also essential during the annotating tasks of Study B.

Coming back to the aspect of the **attributes of the moving images**, an additional finding from combining the conclusions of the three studies is that there are important relations between the attributes that are considered important for searching, and the attributes that are considered essential for annotating (describing) the moving images. In relation to the commonalities, the most relevant aspect is that using the elements of film and media-work identification (e.g., title or director) is both essential for searching and for describing. Conversely, during a moving image description/annotating task, scholars will intensively use cinematographic terms (e.g., stylistic features) at different levels, but these terms are not frequently used as query terms during retrieval. While the common aspect (i.e., issness metadata) is explained by the fact that being able to identify a film (or media) work according to historical periods is one of the main characteristics of the expert's domain knowledge; the differentiating behavior between the searching and describing task has different explanations. One of the most important ones is that there are critical attitudes towards the use of domain-specific terms for searching and describing. Indeed, there are different opinions about the limitations of using isolated tags or keywords to convey stylistic content information; likewise, scholars have critical attitudes about the use of keywords for content

access for research purposes, in particular when they are provided by online social sharing services. Arguments in this regard are that these keywords may be biased, reductionist, inaccurate, inconsistent or too numerous and random. Hence, when content or subject-related keywords are used in an information system (e.g., YouTube, or an archive's catalog), they are considered only as departing points for searching or browsing during the task of constructing a research corpus. This is one of the most important seeking activities associated to the initial stages of the scholars' research, whic is often done through different systems, using varied keywords. Those keywords used for searching elements for the corpus may not correspond to the terms used by the scholar in the analysis of those elements.

There are several information annotating-behaviors identified in this research. In relation to tagging behavior the similarities between experts and novices in assigning factual tags described above may be due to the fact that tagging requires less cognitive effort than other forms of annotation or categorization, as other authors have also suggested, and due to the effect of **competitive games** such as *"Waisda?"*, used in this thesis to collect tags for films. In relation to this form of human computation, this thesis found that competitive games may not be the best way to elicit domain expert descriptions for moving images, especially if time constraints are introduced, and if there is no option for replaying or pausing the videos, since the need for speed and scoring based on matching, forces the users to perform the less cognitive demanding task of common object identifications. Besides the need for investigating novel forms of "metadata games", if domain experts in the film and media domains are to be involved in this form of annotation, a most pressing factor is the need to design clear instructions for the tagging activity.

Indeed, applying the criteria of "prominent depiction" and "novelty" to moving images that would make annotations more meaningful for researchers is obviously not a simple or straightforward task. Similarly to the case of textual resources, a human or automatic annotator must consider several factors to apply those criteria when "indexing" or annotating. In the case of moving images, the "translation" or representation of visual codes into textual codes is actually associated to essential IR (and linguistic) problems of meaning, "mental lexicons" (Aitchison, 2012), "utility community" or "social utility"* judgement or assessment. Being aware of and balancing these factors is a demanding cognitive activity, which result is determined by the annotator's (actor) background knowledge, his/her level of IR stewardship, motivation, and task perception. In addition, being aware of the granularity level of the annotation (according to the levels in Figure 2.1), and the required semantic levels ("ofness" vs "aboutness"), plus the semantic aspects to be annotated (e.g., *cinematographic*, *emotional*, etc.) also add cognitive demands to the annotating activity. This is one of the reasons why the need for instructions or guidance that was found in Study A (Conc.A4) was also prominent in Study B (Conc.B9), showing that participants of an information annotating task (related to moving images in this case) need a clear task description with explicit indications of which the priorities should be during the annotation. This finding indicating the central role of the task is not surprising, and it actually corresponds to the idea in The Turn that the work task serves as the *driving force* underlying IS&R and

information behavior (§6.3.1). In the case of information-annotating behavior this principle becomes more evident.

However, most scholars hold positive **attitudes** towards sharing their annotations online, but, as a logic consequence of the aforementioned idea, only in the framework of initiatives that are well-structured. Whereas there did not seem to be an active participatory culture of sharing information online among the participants in the studies in this thesis, scholars stated to be willing to participate in *nichesourcing* activities if these are promoted by and supported by frameworks created by respected institutions. Also, scholars suggest that an important factor is that if they are requested to contribute with annotations, these should be linked to their research interests and topics.

To finalize this section, the previous findings related to the three main research questions that guided this study could be in turn summarized in **two salient aspects** of the research problem:

1) In relation to the types of annotations that could be expected from the domain expert contributions, there is a wide variety of possibilities (ranging from isolated tags to complete natural language representations such as film reviews). All these forms of annotations could be considered as (poly)representation(s), more precisely as "annotations" (in the sense given to that term in §3.4.1), or as metatexts, in a transtextual perspective (§6.7).

2) In relation to the broader context of use that *nichesourced* annotations could have in supporting moving image-seeking processes during research and teaching-related tasks, the information behavior of the investigated groups indicates that the forms of access to the content of moving images not solely rely on media intrinsic features, but in several other strategies that include community support and intensive use of different polyrepresentations.

The next section discusses the practical implications derived from these two aspects.

8.3. Implications for media annotation research and practice[176]

Most moving image archives to date are focused in cataloging and providing access to their own holdings based on item types. Hence, in many archives, the division between the "film" collection, the document (paper or graphic) collection, and the library (documentation) collection is common and not connected to other archives' descriptions or to the Web. These divisions have been established, logically because of preservation requirements of each type of physical entity and requirements of each archive, but also because of the common separation between the annotating traditions that are used in each case, with their respective views about catalogs, archival collections, and informal annotations. The lack of openness to external "user" contributions that motivated the initial questions for this research (§1.1), may

[176] Besides the direct findings from this thesis' studies presented in the previous section, some of the statements in this section are informed by the researcher's own experience after a three month internship at one film archive, and from the preliminary survey and observation of a sample of film archives' websites. See §4.6 for methodological considerations.

not be only due to the inherent difficulties of integrating metadata into "existing workflows"[177], but even that those flows between the metadata may not exist because of this fragmentation.

In addition, since cultural heritage *crowdsoucing* is an emergent field of experimentation for institutions in the audiovisual area, most projects have adopted expected forms of enabling external user contributions. These ways have been mostly film identification, recognition of characters or places depicted in the images, support in transcription of digitized "paper" collections, or tagging in a time-based fashion[178]. For memory institutions where only the most explicit and formal types of representations (e.g., isness metadata, or content keywords), produced with a high level of stewardship (§3.5.1) are regarded as "metadata", the fact of having "users"' contributions in other forms different than the options mentioned above, represents a challenge.

The following observation is presented as an illustration: after a study about user-contributed comments provided to the National Archives of the Netherlands digital collection, launched in 2004, and containing approx. 500,000 images back then, Van Hooland (2006), found that users contributed with several types (i.e., critical comments, narrative elements, personal stories, opinions, dialogs or questions, or problems related to display). From the analysis, Van Hoolan's pionneering analysis of users' comments concluded back then that the most recurrent types of comments (i.e., posting corrections to existing metadata) were clearly useful for improving correctness and precision, or that other notifications provided by the users could equally help in clearing the errors in the database. However, it was, van Hooland explained, "less evident to assess the pertinence within a historical image database of narrativity, the inclusion of personal experiences, opinions and the dialog between users" (Van Hooland, 2006, p. 13). Even though this statement was done almost ten years ago, the implicit perception is actually representative of a still valid concern in the audiovisual heritage sector, about enabling external contributions in their catalogs when they are not obviously related to formal metadata.

The non-controlled forms of contributions can be difficult to deal with, and are often not allowed into the system of curatorship. These thesis' findings, summarized in the previous section, show evidence to support the claim that, instead of being a problem, when the contributors are done by groups of experts in a domain and in a structured way, those annotations can support the fulfillment of different fundamental archival and scholarly functions. Those functions, which partially overlap with what curators and LIS researchers have also identified as the core mission of memory institutions, can be summarized in:

(1) The traditional "metadata" (retrieval and access) function.

[177] The term "workflow" is most commonly used in television archives. However, through direct experience, it is possible to know that also film archives (though not oriented to production) have internal workflows of preservation, exhibition, and outreach activities, which require equivalent metadata integration and workflows.

[178] A list with examples of these initiatives is included in Appendix O.

(2) A scholarly function to increase the sources' understanding and interpretation.

(3) A mediating function.

These three functions emerged from two basic conceptualizations proposed in this thesis: the first one is a "holistic and organic approach" to the concept of annotation, discussed in Section 3.4.1, and a result of the application of the principle of polyrepresentation in IIR. The second and third functions are a consequence of viewing polyrepresentation in the perspective of literary (and media) transtextuality discussed in Section 6.6.

In relation to the **first function** above, adding to the amount and quality of the archives' collection metadata is the most obvious expected benefit of any *crowdsoucing* or *nichesourcing* initiative from an IR perspective. The increasing demand for fragment access in the context of reuse explains why time-based annotations in the form of tags were at the core of the successul *"Waisda?"* project, the largest *crowdsoucing* initiative at a substantial scale in the audiovisual domain to date[179]. These tags can relatively more easily be processed and integrated in the archives' metadata to improve retrieval by using post-processing, and are a laudable initiative to disseminate audiovisual heritage and engage broad audiences. However, this form of contribution through isolated tags, as this thesis showed, does not match the expectations and requirements of the domain expert community. Hence, isolated time-based tags would not be the best way of engaging the domain experts, or in generating the best annotations that they could produce and be used in turn for supporting all forms of media-based research.

The ideal way, according to the thesis findings, would be to allow domain experts to participate in a more flexible way in the media annotation process. This flexibility consists of leaving the choice of a given type of representation (or annotation) to the domain expert. This selection that (s)he would make could happen in the context of a pre-set *nichesourcing* project, but it could also be done as a result of their natural work tasks during the "routine" work of archival materials' consultation. This adaptability is benefitial from a cognitive point of view, since it enables a better expression of the experts' domain knowledge, and shows her/him a more natural way of using her/his contribution (i.e., not only based on the need of facilitating reuse for other groups). However, this "anarchical" view of enabling users' participation is hard to envision and implement, since it does not correspond to the mission of a memory institution, which is to provide curatorial and indexing mechanisms based on formality and control, which partially were caused because of the way in that rigid IR systems from previous periods used to function.

Given the fact that one of the most important requirements from the scholars in order to participate in eventual *nichesourcing* initiates was also to have guidance or clear instructions for their participation, an intermediary step could be to create guidelines that enable more flexible or spontaneous (yet guided) forms of contributions. As it was described in this thesis

[179] Another project at a large, national scale, is The Estonian Film Database. However, there is not enough information publicly available to evaluate this project at the moment (November, 2015). See also Appendix O.

(§6.5.2.1) current work in the domain of "natural language representations" could be benefitial for processing "open" textual forms, such as comments or other types of open annotations. However, another potential way to achieve the ideal situation presented above could be to apply these techniques not only to the post-processing of existing representations, but also to the design of guidelines that can provide structure from the moment they are created.

For instance, a scholar could be allowed to create a free natural text or annotation, and subsequently be requested to categorize (or select a recommended category) which type does her/his text corresponds to (i.e., plot synopsis, critical synopsis, review), based on similar definitions proposed in this thesis (§6.5.1). Another way, more suitable for experts with a higher IR stewardship level, would be to provide guidance during the construction of those texts, by requesting first to describe a plot, and then to provide background information, and opinion or argumentative texts later, based on the patterns identified for each type of text (§6.6). Naturally, time-based tags, or tags that apply to the entire media work are also listed within the options, or would appear in the access interfaces that enable annotating interaction. In the cases in which time-based annotations are created, there should be also flexibility in time frame selections, and an option for the scholar or curator to indicate why a specific fragment was selected by having the option of adding a comment to her/his annotation, or also to engage in discussions with peers during a collaborative annotating task.

Many options start to emerge once the concept of indexing, tagging and annotating are broadened and integrated, and once film and media theory is considered as an enlightening way to understand textual structures. For instance, current research about "semantic entities", "text schemata", "semantic fields" or other semiotic or structuralistic approaches to media as text proposed by film and media theoreticians, indicate the presence of these patterns in the structures of texts that discuss films and media (§6.6). Study B showed examples on how those patterns do occur in the scholars' written texts. In addition, more sophisticated IR mechanisms based on polyrepresentation could be used in combination with computational linguistic methods to process these natural language representations and link them to fragment information, thus facilitating content retrieval via textual representations. However, a more important consequence of considering annotation in a holistic way is that the cognitive space is enriched. Until about 2005, indexing as performed by information professionals has been the only accepted form of annotation, and indexers have been "annonymous" people, and their annotations stand as authoritative forms that cannot be questionned. With the emergence of tagging, the "user" (meaning the person who annotates) reached a place in the annotating process, as it is observed in the common tagging model depicted in Figure 3.3. In the beginning of the tagging phenomena, the users' details were exploited to enable connections between the tags and enable recommendation or better retrieval based on users' profiles. To date, studies about tag provenance indicate that information about the users is essential to guarantee quality. In a holistic perspective of annotation, cognitive information from the indexers or any other types of annotators would

be also needed.

This view of indexing and annotation as flexible forms of communication that can coexist with formal representations in a "polyrepresentative" cognitive space connects to the **second function** above[180]. These thesis' findings and previous research provided evidence to state that, in the humanities, not all seeking behaviors are related to finding items or information, but also to complex tasks that require support for reading, writing, discussing, and collaborating during information organization, interpretation or dissemination of the media works[181]. Indeed, the current tendency to provide information services to "digital scholars" by proposing innovative ways of processing information based on state-of-the-art technologies (e.g., APIs) is challenging scholars to formulate new questions, implement data-driven methods, and even re-think their disciplines. However, it is important that IT service providers are aware of the fundamental differences in the perception of what "access" means for both groups. In the case of film and media scholars (and other groups of humanities scholars), "access" is conceived as a process of interpretation, communication, education and dissemination. In turn, the information service providers usually think of "access" as a way of retrieving documents or their content.

As a way to complement these views, one of the possibilities that the thesis findings showed is the need to regard polyrepresentation(s) in a transtextual, rhetorical and semiotic perspective. These considerations facilitate seeing metadata both as a type of text in a broad sense (a metatext or an architext in Genette's terms), which is intentionally created for a retrieval purpose or not, depending on the level of IR stewardship of the actor creating the annotation. All these metatexts can be used as a source of "document features", and thus, serve a retrieval purpose. But even if they do not, these metatexts can support the second function, of support for scholarly understanding and interpretation.

To date, the implemented IT solutions in the cultural heritage domain have been designed to support the lookup types of tasks. In current practice, and in the best cases, film archives provide access to their collections through OPACs. These catalogs are databases for one-way cataloging and consultation, which most often only provide known item-based annotation and retrieval. Thus, the complex tasks are often carried out by the scholars through "analog" or general purpose informal communication channels (e.g., e-mail) and traditional offline community networks. The trend within the digital humanities is to support some of those complex tasks through information processing systems while at the same time enabling information management required for research and curatorial activities[182]. For that reason[183],

[180] This perspective is also aligned with current research in the scientific domains, which are out of this thesis's scope. Recent debates in that area indicate that linked data is not enough for scientists ((Bechhofer et al., 2013)), and that one recommendation to avoid the difficulties in data sharing is to enable annotation of the data at the time it is generated, in an automated way; also digitizing or keeping digital versions of the traditional lab notebooks (De Schutter, 2015)

[181] Among others, scholar and curator Giovanna Fossati talks about a "film's interpretive flexibility" (Fossati, 2009); and film scholars Frank Kessler and Sabine Lenk indicate that film is a sort of "chameleon"(Kessler & Lenk, 2014).

[182] A study about the needs of cultural heritage experts, shows the importance of thinking on supporting not only the

film and media scholars, regardless of their research focus, do not expect more support than a basic consultation for basic identification details of the film or media works in the film archive's catalogs or other online collections, and base most of their online information-seeking strategies in looking for specific works or items.

But in order to accomplish the goal of supporting film and media scholarship through current information systems, these systems would need to facilitate interaction and collaboration with the several processes involved in the construction of meaning, hence becoming IT solutions that support social reading (§3.4.1). They should consequently be systems that support annotation, and thus explicit meaning construction and meaningful interactions in real time. The design of this type of IR system could be informed by developments in the area of collaborative information seeking or "social computing (§2.6.1). For instance, this thesis reviewed a few experiences in creating "collaboratories" applied to the film domain (§2.8.2 and §7.4.4). Collaboratories (and cognitive work analysis (CWA)-related research), are closer to the aforementioned concept of OPACs or IR processing systems as "social reading platforms", "embedded usages", and polyrepresentation-aware IIR systems that enable transtextual and cognitive (poly)representations (§6.6)[184]. These systems incorporate functionalities that are provided to researchers by other isolated annotating "tools" (e.g., CAQDAS or other media personal annotation systems) that usually only work for individual use (§2.8.1). In collaboratories, by default, metadata with different origins can coexist, but also different types of annotations together with their provenance information.

The functions introduced above indicate that opening up the archive for external experts contributions to the annotation process would not only result in new forms and sources of metadata, but also in providing support to researchers during seeking processes in which "human" reading and interpretation is needed. In this sense, from a scholarly and audiovisual archival perspective, the domain expert users' textual contributions are absolutely essential to support scholarship and communication, even if transforming them into useful/structured metadata could be cumbersome or not at all possible.

A **third function** would be a natural result of the conceptualizations above, since both metatexts and paratexts have the purpose of attracting the reader's/viewer's attention to the important aspects of the moving images (as discussed in §6.7). Hence, the mediating function can also be accomplished. Also, some domain experts have lower levels of IR stewardship, or may be reluctant to participate in formalized projects for annotation. In this thesis, some

need of "external" users, but also of "internal" workers (Amin, van Ossenbruggen, Hardman, & van Nispen, 2008). At a film archive, providing systems that facilitate this link among curators and with researchers is fundamental for enabling an integration of the expert annotations in the archive's metadata workflow.

[183] And also because of other aesthetic issues related to the perception of each film as a "work" of art.

[184] An example of a practical implementation of the principles of polyrepresentation is presented by Lanagan and Smeaton (2012). Even though they do not use this term, their system demonstrates how the perspective of "democratization of content creation, publishing, and sharing" (p.176) can be used in practice in order to design an information system in a (polyrepresentational) way. Their study also shows that metrics associated to the quality of the content based on their creators' trust can be used during relevance ranking. Current research on information retrieval based on trust metrics and provenance information is a key factor in the context of user-generated annotations (§2.5.1).

texts created by the scholars had a tendency to communicate the value of a given information object to the potential readers or users. Indeed, as indicated in the study, some scholars assume that they have the responsibility (derived from their knowledge about cinema and cinematographic expressive resources), to highlight the valuable elements when they exist. Inviting domain experts to make available these contributions into an archive would give new life to archival objects, since one of the main characteristics of paratexts is to accompany the text from a distance, as Genette explains, facilitating dissemination and communication.

Given the advantages (and necessity) of enabling the creation of expert polyrepresentation(s) shown in the three functions that these annotations can fulfill, questions arise about the ways to implement *nichesourcing* initiatives through projects, or in a more permanent way. The previous paragraphs have shown the need for broadening the scope of (user) expert generated contributions, and, ideally, for integrating them into the permanent information system of the archive, where all forms should of annotation interaction should be enabled. However, if priorities have to be set, the selected types of annations and *nichesourcing* projects should emerge from the identification of **annotating tasks** (e.g., correcting/transcribing tasks, classification tasks). A tension arises at this level, on whether supporting the scholars' natural work tasks based on research questions, or on whether supporting more generic archival tasks. In relation to research questions-based tasks, there are some suggestions presented in Appendix N. In what concerns the second group of tasks, the simplest way of enabling an "adding metadata task" seems to be through requesting issness metadata that is missing in the archive. However, other forms of adding metadata may arise after studying the scholars annotating behavior. For example, film scholars will cross-check information, as this is part of being a "humanist" scholar (i.e., to perform source criticism). This critical attitude represents an advantage for *crowdsourced/nichesourced* projects since the normal task of a usual check for validity could be used as a scholar's input, or "dual-purpose work"[185], if enabled and authorized.

A less evident form of adding "metadata," is that of linking**.** This is a result of the proposed adoption of concepts from transtextuality theory suggested in this thesis and a consequence of the limitations of accessing moving image content based on automatically extracted features. Indeed, in film studies, theoreticians have provided support to the idea that a moving image does not exist alone, but as a unit with its paratexts (§6.6). Linking "the" moving image to its (trans-textual or trans-media) representations is an idea that finds correspondence in the IIR discipline via the polyrepresentation principle. The linking task can be achieved at different levels, from inter-medial connections to more complex hypertextual relations (such as "parody" or "imitation"). These "adding issness metadata" and "linking" tasks appear to be fundamental for achieving the functions of a *nichesourcing* initiative that could be of interest, and benefitial, to all of the focuses in film and media scholarship

[185] According to the different types of human computation defined in §2.6.1.

identified in this thesis.

In addition, because of the need to support social reading, and within the scope of the transtextuality and annotation concept, the co-relations established through an information system have to be explicitly explained by the actor who proposes them (e.g., if it is a paratextual or hypertextual relation that is being established). One of the most interesting consequences of this proposition for the "mediating" function stated before in this section is that also experts in other domains, and casual users who have a degree of interest in the topic (i.e., film), may contribute with their "linking" ideas. For example, a common activity by film enthousiasts is identifying parody and imitation, while scholars may also look for adaptations. Being able to establish these connections, explaining the reasons for the choices, connecting them to provenance information that guarantees verification and reliability, would convert the one way catalog into a real social reading and collaboration platform.

The previous arguments presented in this section have implications for current efforts carried on by data standardization bodies, where a separation between different annotation traditions prevails, but also where the "user" shown in the simple tagging model in Figure 3.3 does not seem to have made its way in. The polyrepresentation principle indicates that information systems should not strive to "harmonize" the multiple representations, but to benefit from their variety as a way to enhance information retrieval. However, this could be favored by conceptual frameworks or domain ontologies that enable flexible and structured user participation in the annotation. The efforts in developing different ontologies depending on the type of annotation and the community of the designers of the standards seem to be fragmented though (§2.9), making it difficult for media archives to seek internal and external interoperability. As part of the role of the standardization bodies, with international associations of film or media archives as mediators, guidelines or lists of best practices to enable user-generated annotations would most likely be well received by the archives.

It is important to clarify at this point that the aforementioned idea of providing more integration between the standards to open integration of user-generated annotations is not equivalent to efforts for standardizing terminology or vocabulary encoding schemes (VES) for shot analysis and the cinematographic terms that are used in moving image descriptions. In spite of the appealing potential that providing controlled vocabularies for time-based annotations may represent, adding isolated keywords or tags to types of shots without having the option to explain or contextualize through annotation the reasons for their selection or use, may not be a priority for the support of film scholarship. Indeed, this thesis found that scene fragmentation, types of shots and camera movements are not perceived as objective categories by the scholars. Rather, these fragmentations and descriptions vary depending on the scholars' research questions. For that reason, systems that support annotations at different granularity levels should be flexible enough to facilitate customized item annotation, grouping of items, or time-frame selections, by supporting different terminologies, and most importantly by adding functionality for open annotations where the expert can freely explain what (s)he observes from a media work at all its levels (from frame to fonds). However, being

aware that this situation may be different in the realm of commercially or production oriented archives is also important to take into account in the case of specific audiovisual archives.

Even though the practical implications of the concepts developed in this thesis presented in this section may sound unrealistic or not achievable for most audiovisual archives, the *nichesourcing* perspective brings to the scene the debate about the role of the archives in engaging their user communities. Indeed, the condition to locate *niches* or communities of practice requires strategic decisions from memory institutions to know and foster their relations with their user groups. The three functions presented in this section, about the benefits that external expert (and eventually novice) contributions bring to the annotation workflows (in place or to be created), remind the archives of the need to switch their attitudes towards users' contributions as part of the current information landscape, conveyed with the concept of "participatory curatorship"[186]. In the audiovisual heritage sector this is part of an essential *link* of the broader "sociotechnical, or purely human" systems[187] of collaboration between memory institutions and the research community already in place or also in the essential quest to be created.

8.4. Implications for IB studies

The implications presented in the previous section about the need for supporting flexible (yet) structured annotation mechanisms based on the actors' annotating behavior shows the need for IB studies at that level. However, apparently, the IB micro-models are a step behind in providing conceptualizations for the kinds of interactions that people experience with information when they perform annotating activities such as indexing, tagging, or glossing (§3.3.2). The main behaviors that have been studied by IB are information seeking and searching, with an important focus on information needs as the trigger for the information-seeking process (§3.2.3). However, an important and not so well studied phenomenon is that of information annotation as a form of information use. The challenge presented by the Social Web, in which users are allowed to interact and provide their own input during information seeking and retrieval actions, also performing indexing-like activities, requires more attention from an IB theoretical perspective.

The main research problem that motivated this thesis was the need for an analysis of the *nichesourcing* initiative from the perspective of *moving image* expert annotations. The importance of understanding this initiative in a broader context led to observe all the disparate forms in which annotation to this type of documents occur (Chapter 2), and in which many potential domain expert *niches* could be identified for establishing collaboration with audiovisual archives. The need for selecting a theoretical model to understand these phenomena and frame this thesis' research problem was evident after this observation.

[186] (Fossati & Smith, 2012)
[187] Using Fidel's 2012 terms.

However, as a consequence of the need to build this framework, unexpected findings at the theoretical level lead to the need for suggesting, or making evident, two aspects: (1), the need for adapting the IS&R framework for the study of information-annotating behavior (§3.5); this transformation seemed compelling in order to update the model which is, in principle, oriented to explain the need for polyrepresentation in IR; and (2), the proposal for a transforming the current focus of IB studies in information seeking, searching, and use as isolated areas.

In relation to the first aspect above, the IS&R framework, designed for guiding IIR research, proved to be very useful as a framework for the study of information-annotating behavior, and could also be used to orientate thinking about designing services and initiatives. Also, the fact that the type of task is part of the **cognitive space** in an IS&R framework indicates that the connection between the scholar and her/his task may be too tight. Indeed, this thesis found evidence that scholars gain motivation for contributing if the tasks are of interests to them (§8.2). This confirms the common finding of a long tradition of IB and LIS research, which assumes that extensive knowledge of the scholars' information behavior is a prerequisite for the success of information services. What this thesis adds to that common argument is that, not only their information seeking and search behavior could provide input, but also knowing the characteristics of the annotating behavior of the experts or novice users.

In relation to the second aspect above, one of the outcomes of the analyses performed in this thesis, was the proposal of including information-annotating behavior as a sub-area of information-use behavior studies (§3.7). Based on the different findings of this thesis, and Wilson's (2000) definition of Information-use behavior, a proposal for defining the study of **information-annotating behavior** is the following:

> A sub-area of IB research, more specifically of information-use studies, that investigates how people interact with information by creating indexes, tags, keywords, comments, notes or other metatextual or embedded representations in any media, through engagement with reading, interpretation, aboutness representations, or creation of original or derivative documents. This interaction is part of broader processes of knowledge creation, construction, leisure, and communication in different settings. The personal factors are at the center (i.e., the "cognitive actor", or also a team, and including their cognitive and emotional states). Thus, the focus of information-annotating behavior is on people rather than on studying the mechanisms to obtain the outputs of their annotations, or than studying those outputs in isolation.

Personal factors include but are not limited to the study of: annotating habits, preferences for a given type of annotation, motivations for annotating, the influence of domain or indexing expertise, attitudes towards sharing the annotations, or preferences for a given form of information system-mediated interaction –for example, games, or other forms of human computation. Several additional factors were identified as possible sub-topics (§3.4.2).

Finally, information-annotating behavior studies share concern with personal information

management (PIM), information literacy, and reading cultures research, and benefit from findings in communication studies and other disciplines (e.g., semiotic theories, literary studies about media criticism and transtextuality). These connections have been inially anticipated by IB theory and the polyrepresentation principle, but require future research to have more intensive application to enhance moving image annotation and access.

8.5. Implications for future research

One of the strengths of adopting the IS&R framework as this thesis' theoretical framework is that its authors present a research program based on it (§3.6). By using the model's dimensions, this section summarizes the implications that the studies conducted in this thesis have for future research on information-annotating behavior applied to moving images. These variables are not intended to be used only for generating research questions to be used during IIR evaluations (which in the original framework are presented as the IIR view of laboratory testing), but also to identify research questions within the scope of information behavior studies.

The "variables" that are included in each dimension, are also informed by two sources of evidence: (1) the elements identified in one of this thesis' sections (§3.4.3) for the study of information-annotating behavior; and (2), the "six pillars" of a *crowdsoucing* project, developed by Noordegraaf and Bartholomew (2014), described in Section 3.5.1. Those previous pillars apply to the domain of cultural heritage *crowdsoucing*. Next, there is a proposal to complement the original research dimensions of the IS&R framework, by including new topics (instead of "variables") identified through the two sources indicated above, and informed by the findings of this thesis' studies.

Table 8.1. Research dimensions and topics for studying information-annotating behavior of moving images in an IB-IS&R perspective

Research dimension	**Elements (variables) for the study of information-annotating behavior**	**Sample of research topics derived from thesis findings/Implications for future work**
The Organizational Task Dimensions	Natural annotating tasks	Generic annotating tasks (e.g., linking, adding) Specific annotating tasks in relation to research questions (e.g., data extraction)
	Annotating tasks in the context of seeking and retrieval tasks	Annotating tasks in collaborative seeking and retrieval environments
	Other	Types of possible niches User research contexts of contribution or potential utility communities (e.g., research, teaching, broadcasting, exhibiting), Specific research questions within a field (e.g., aesthetic, cultural/documental, media history, data driven).
The Actor Dimensions	Actor (declarative knowledge and procedural skills)	Cognition and provenance information Ways of requesting domain expertise and levels of IR stewardship information
	Perceived annotating Tasks (the actor's perception of the work task)	Annotating styles in relation to cognitive styles and searching styles Motivation. Typologies of motivation associated with tasks (e.g., reading (glossing), analysis and categorization (coding), interacting (ranking, sharing and adding comments).
The Document Dimension	Document and Source types (document genres and collections in various languages and media)	Identification of document types in a transtextual perspective (example: figure?)
	The "documents/ annotations/derivatives continuum"	Typologies of functional polyrepresentation possibilities, i.e., the types of metatexts that exist for annotating moving images or media (e.g., tags/keywords, plot synopses, shot lists). Granularity. Ways of annotating and adding and linking annotations to different content levels (e.g., "Fonds, Series, Subseries, File, Item, Chapter, Scene, Sequence, Shot, and Frame").

Research dimension	Elements	Sample of research topics derived from thesis findings/Implications for future work
The Algorithmic Dimension	The algorithmic search engine dimension	Tools for supporting annotation interactions. OPACs as collaboratories and social reading platforms. Requirements for *nichesourcing/crowdsoucing* dedicated project websites Polyrepresentation based retrieval. Testing polyrepresentation with user contributed annotations Computational linguistic methods applied to mining semantic entities in metatexts.
	The algorithmic interface dimension	Adaptive interfaces for flexible/guided annotating interactions. Functionality features (scaffolding levels) in *nichesourcing*/*crowdsoucing* dedicated project websites. Visualization of overlapping cognitive representations/annotations based on provenance information.
	Standards	Inter-mediality. Ways to detect and establish relations to other (existing) media works at different granularity levels (e.g., paratextual functions, such as: "is advertised in") Semantic models. Mappings of scholarly or professional conceptual models for moving-image content analysis (the most important ones being Armitage & Enser, 1997; Geisler et al., 2010; Hertzum, 2003; Rafferty & Hidderley, 2005). Semantic levels. Different semantic or content representation levels (e.g., "ofness", "aboutness", or "contents listings"). Integrating "performative context"[188]dimension into current media annotation standards. Linkage to data about exhibition and distribution (e.g., "is exhibited in"), or in which links to documents where this information can be extracted from are provided. Guidelines on using separated standards for content analysis, types of annotations, semantic models and levels.
	Instruction models	Design of guided structured annotation for natural language representations based on "text schemata" and "semantic fields" used in film/media criticism.
The Access and Interaction Dimension		Recommendation of information objects to participants based on domain provenance information (indexing expert, film/media domain expert, other/domain expert (e.g., historians, scientists). Integration of user-generated annotations in retrieval, browsing, and navigation. Individual, collective working spaces that facilitate continuous work through different sessions.

[188] In the domain of early cinema research, this term is often used to refer to the shows and venues in which the media is presented. Kirkegaard and Borlund (2008) use the terms "transmission dimension" and "reception dimension" to refer to similar aspects of the media works in the context of television broadcast archives. We think that findings from Study C contribute to the research done by Kirkegaard and Borlund's study in a television context, both studies combined provide a general view on media indexing and annotation.

The table above summarizes topics for future research that emerged from these thesis investigations.

The thesis findings and their implications show the importance of a holistic view of the behaviors related to human activities of annotating information for *nichesourcing* and *crowdsoucing* initiatives to succeed, when promoted by audiovisual archives in the cultural heritage sector. Theoretical support from the IB discipline has relevant venues for future research in this important area of information use. Most important, within the scope of that view of the annotation phenomena, *nichesourcing* initiatives would require that the links between audiovisual archives are strengthened with the film and media researchers' communities. This link should not be missing, independently of the level of technology support that they can provide for their establishment, since it is essential for increasing access to the audiovisual cultural heritage, to fulfill the mission of these memory institutions, and for scholarship. Future research in film scholarship, in turn, should consider metatexts as part of the archival moving image*. Finally, the biggest challenge is for the standard designers and the international associations of moving image archivists, is to design guidelines that regard "social annotations" as a serious possibility to accomplish their mission.

REFERENCES

Abbott, D. (2008). Annotation. Retrieved July 2, 2015, from http://www.dcc.ac.uk/resources/briefing-papers/introduction-curation/annotation

Ådland, M. K., & Lykke, M. (2012). Social tagging in support of cancer patients' information interaction. In *Social Information Research* (Vol. 5, pp. 101–128). UK: Emerald Group Publishing.

Agosti, M., Albrechtsen, H., Ferro, N., Frommholz, I., Hansen, P., Orio, N., … Thiel, U. (2005). DiLAS: a Digital Library Annotation Service. Presented at the Annotation for Collaboration: A Workshop on Annotation Models, Tools and Practices, La Sorbone, Paris.

Agosti, M., Bonfiglio-Dosio, G., & Ferro, N. (2007). A historical and contemporary study on annotations to derive key features for systems design. *International Journal on Digital Libraries*, *8*(1), 1–19. http://doi.org/10.1007/s00799-007-0010-0

Agosti, M., Conlan, O., Ferro, N., Hampson, C., & Munnelly, G. (2013). Interacting with digital cultural heritage collections via annotations: the "Cultura" approach. In *Proceedings of the 2013 ACM Symposium on Document Engineering* (pp. 13–22). New York, NY, USA: ACM. http://doi.org/10.1145/2494266.2494288

Agosti, M., & Ferro, N. (2005). Annotations as context for searching documents. In F. Crestani & I. Ruthven (Eds.), *Proceedings of the 5th international conference on Context: conceptions of Library and Information Sciences* (Vol. 3507, pp. 155–170). Berlin, Heidelberg: Springer. Retrieved from http://link.springer.com/10.1007/11495222_13

Aguilar-Gutiérrez, M., & López-De-Solís, I. (2010). Nuevos modos de trabajo de una redacción digital integrada: El caso de los servicios informativos de TVE. *Profesional de La Informacion*, *19*(4), 395–403. http://doi.org/10.3145/epi.2010.jul.09

Ahn, L. von. (2005). *Human computation* (Doctoral Dissertation). Carnegie Mellon University, Pittsburgh, PA.

Ahn, L. von, & Dabbish, L. (2008). Designing games with a purpose. *Communications of the ACM*, *51*(8), 58–67. http://doi.org/10.1145/1378704.1378719

Ahn, L. von, Maurer, B., McMillen, C., Abraham, D., & Blum, M. (2008). ReCAPTCHA: human-based character recognition via web security measures. *Science*, *321*(5895), 1465–1468. http://doi.org/10.1126/science.1160379

Aitchison, J. (2012). *Words in the mind: an introduction to the mental lexicon* (4th ed.). Hoboken: Wiley.

Ajmal, M., Ashraf, M. H., Shakir, M., Abbas, Y., & Shah, F. A. (2012). Video summarization: techniques and classification. In L. Bolc, R. Tadeusiewicz, L. J. Chmielewski, & K. Wojciechowski (Eds.), *Computer Vision and Graphics* (pp. 1–13). Springer Berlin Heidelberg. Retrieved from http://link.springer.com/chapter/10.1007/978-3-642-33564-8_1

Albera, F. (2004). Considérations introductives. In I. Bessière & J. A. Gili (Eds.), *Histoire du Cinéma: Problématique des Sources*. Paris: Institut National d'Histoire de l'Art; Maison des Sciences de l'Homme; Centre d'Etudes et de Recherches sur l'Histoire et l'Esthétique du Cinéma; Association Française de Recherce sur L'Histoire du Cinéma (AFRHC).

Albrechtsen, H. (1993). Subject analysis and indexing: from automated indexing to domain analysis. *The Indexer*, *18*(4), 219–224.

Albrechtsen, H., Mark Pejtersen, A., & Cleal, B. (2002). Empirical work analysis of collaborative film indexing. In *Emerging frameworks and methods* (pp. 85–107). Greenwood Village, Colo.: Libraries Unlimited.

Alemu, G. (2014). *A theory of digital library metadata: the emergence of enriching and filtering* (phd). University of Portsmouth. Retrieved from http://eprints.port.ac.uk/15350/

Alonso-Lifante, M. P., & Chain-Navarro, C. (2013). Google Sky and cataloguing standards : an example of the divergence between the most queried astronomical information and what cataloguing standards allow us to describe. *Revista Española de Documentación Científica*, *36*(4).

Ames, M., & Naaman, M. (2007). Why we tag: motivations for annotation in mobile and online media. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 971–980). New York, NY, USA: ACM. http://doi.org/10.1145/1240624.1240772

Amin, A., van Ossenbruggen, J., Hardman, L., & van Nispen, A. (2008). Understanding cultural heritage

experts' information seeking needs (pp. 39–47). Presented at the JCDL '08, New York, NY, USA: ACM. http://doi.org/10.1145/1378889.1378897

Amin, A., Zhang, J., Cramer, H., Hardman, L., & Evers, V. (2009). The effects of source credibility ratings in a cultural heritage information aggregator. In *Proceedings of the 3rd Workshop on Information Credibility on the Web* (pp. 35–42). New York, NY, USA: ACM. http://doi.org/10.1145/1526993.1527003

Andersen, J. (2002). Materiality of works: the bibliographic record as text. *Cataloging & Classification Quarterly*, *33*(3-4), 39–65. http://doi.org/10.1300/J104v33n03_04

Anderson, J. D., & Pérez-Carballo, J. (2001a). The nature of indexing: how humans and machines analyze messages and texts for retrieval. Part II: Machine indexing, and the allocation of human versus machine effort. *Information Processing and Management*, *37*(2), 255–277. http://doi.org/10.1016/S0306-4573(00)00046-7

Anderson, J. D., & Pérez-Carballo, J. (2001b). The nature of indexing: How humans and machines analyze messages and texts for retrieval. Part I: Research, and the nature of human indexing. *Information Processing and Management*, *37*(2), 231–254. http://doi.org/10.1016/S0306-4573(00)00026-1

Andreano, K. (2008). The missing link: content indexing, user-created metadata, and improving scholarly access to moving image archives. *The Moving Image*, *7*(2), 82–99. http://doi.org/10.1353/mov.2008.0005

Angus, E. T., & Thelwall, M. (2010). Motivations for image publishing and tagging on Flickr. In T. Hedlund & Y. Tonta (Eds.), . Presented at the ELPUB2010. Publishing in the networked world: Transforming the Nature of Communication, Helsini. Retrieved from http://elpub.scix.net/cgi-bin/works/Show?113_elpub2010

Annotation. (2014). *Oxford advanced learner's dictionary* (Online edition). Retrieved from http://www.oxfordlearnersdictionaries.com/definition/english/annotation?q=annotation

Aradhye, H., Toderici, G., & Yagnik, J. (2009). Video2Text: Learning to annotate video content (pp. 144–151). Presented at the ICDM Workshops 2009 - IEEE International Conference on Data Mining, IEEE. http://doi.org/10.1109/ICDMW.2009.79

Arastoopoor, S., & Fattahi, R. (2012). Users' perception of aboutness and ofness in images: an approach to subject indexing based on Ervin Panofsky's theory and users' view. In A. Neelameghan & K. S. Raghavan (Eds.), *Categories, Contexts and Relations in Knowledge Organization: Proceedings of the Twelfth International ISKO Conference 6-9 August 2012, Mysore, India*. Ergon.

Armitage, L. H., & Enser, P. G. B. (1997). Analysis of user need in image archives. *Journal of Information Science*, *23*(4), 287–299. http://doi.org/10.1177/016555159702300403

Åström, F. (2014). The context of paratext: a bibliometric study of the citation contexts of gérard genette's texts. In N. Desrochers & D. Apollon (Eds.), *Examining Paratextual Theory and its Applications in Digital Culture* (pp. 1–23). United States: IGI Global.

Auffret, G., & Prié, Y. (1999). Managing full-indexed audiovisual documents: a new perspective for the humanities. *Computers and the Humanities*, *33*(4), 319–344.

Aversa, E. S. (2012). The humanities and the arts in the 21st century. In A. H. Perrault, S. R. Wohlmuth, & C. Miller (Eds.), *Information Resources in the Humanities and the Arts* (6th ed., pp. 3–23). Santa Barbara, California: Libraries Unlimited.

Baca, M. (2002). *Introduction to art image access: issues, tools, standards, and strategies*. Los Angeles, CA: Getty Research Institute.

Baca, M. (2009). Controlled vocabularies for art, architecture, and material culture. In *Encyclopedia of library and information science* (Third edition, pp. 1277–1281). New York: M. Dekker.

Bálint, K., & Kovács, A. B. (2012). Focalization and attachment. studying the interaction effect of narrative and psychological factors in film viewers' emotional responses. *Pszichológia*, *32*(3), 271–291. http://doi.org/10.1556/Pszicho.32.2012.3.6

Ballan, L., Bertini, M., Del Bimbo, A., Meoni, M., & Serra, G. (2010). Tag suggestion and localization in user-generated videos based on social knowledge. In *Proceedings of Second ACM SIGMM Workshop on Social Media* (pp. 3–8). New York, NY, USA: ACM. http://doi.org/10.1145/1878151.1878155

Ballan, L., Bertini, M., Del Bimbo, A., & Serra, G. (2011). Enriching and localizing semantic tags in

internet videos. In *Proceedings of the 19th ACM International Conference on Multimedia* (pp. 1541–1544). New York, NY, USA: ACM. http://doi.org/10.1145/2072298.2072060
Baltussen, L. B., Brienkerink, M., & Oomen, J. (2010). *Evaluatieverslag Waisda?: taggen van audiovisueel archiefmateriaal in spelvorm; kennisbank audiovisuele archivering*. Retrieved from http://www.avarchivering.nl/node/873
Barber, S. (2012). Understanding online audio-visual content: a european initiative, media literacy and the user. *Media Studies*, *3*(6), 28–40.
Bar-Ilan, J., Shoham, S., Idan, A., Miller, Y., & Shachak, A. (2008). Structured versus unstructured tagging: a case study. *Online Information Review*, *32*(5), 635–647. http://doi.org/http://dx.doi.org/10.1108/14684520810914016
Bar-Ilan, J., Zhitomirsky-Geffet, M., Miller, Y., & Shoham, S. (2010). The effects of background information and social interaction on image tagging. *Journal of the American Society for Information Science and Technology*, *61*(5), 940–951. http://doi.org/10.1002/asi.21306
Bates, M. J. (1990). Where should the person stop and the information search interface start? *Information Processing and Management*, *26*(5), 575–591. http://doi.org/10.1016/0306-4573(90)90103-9
Bates, M. J. (2001). *Information needs and seeking of scholars and artists in relation to multimedia materials*. Los Angeles, CA: Department of Information Studies, University of California. Retrieved from http://pages.gseis.ucla.edu/faculty/bates/scholars.html
Bates, M. J. (2009a). Information. In *Encyclopedia of Library and Information Sciences* (3rd ed., pp. 2347–2360). New York: Taylor & Francis.
Bates, M. J. (2009b). Information behavior. In *Encyclopedia of Library and Information Sciences* (3rd ed., pp. 2381–2391). New York: Taylor & Francis.
Bauer, C., Boch, L., Poncin, P., & Herben-Leffring, C. (2005). *Analysis of current audiovisual documentation models, Mapping of current standards D15.1 | Kennisbank audiovisuele archivering*. PrestoSpace. Retrieved from http://www.prestospace.org/project/deliverables/D15-1_Analysis_AV_documentation_models.pdf
Baxter, K., & Courage, C. (2005). *Understanding your users: a practical guide to user requirements methods, tools, and techniques*. Elsevier. Retrieved from http://www.sciencedirect.com.proxy.library.uu.nl/science/book/9781558609358
Bazeley, P., & Jackson, K. (Eds.). (2013). *Qualitative data analysis with NVIVO* (Second Edition edition). Los Angeles i.e. Thousand Oaks, Calif.; London: SAGE Publications Ltd.
Beaudoin, J. (2005). Image and text: a review of the literature concerning the information needs and research behaviors of art historians. *Art Documentation: Journal of the Art Libraries Society of North America*, *24*(2), 34–37.
Bechhofer, S., Buchan, I., De Roure, D., Missier, P., Ainsworth, J., Bhagat, J., … Goble, C. (2013). Why linked data is not enough for scientists. *Future Generation Computer Systems*, *29*(2), 599–611. http://doi.org/10.1016/j.future.2011.08.004
Beer, D., & Gane, N. (2008). *New media: the key concepts* (English Ed edition). London; New York: Berg Publishers.
Beghtol, C. (2003). Classification for information retrieval and classification for knowledge discovery: Relationships between “professional” and “naïve” classifications. *Knowledge Organization*, *30*(2), 64–73.
Benardou, A., Constantopoulos, P., Dallas, C., & Gavrilis, D. (2010). Understanding the information requirements of arts and humanities scholarship. *International Journal of Digital Curation*, *5*(1), 18–33. http://doi.org/10.2218/ijdc.v5i1.141
Benardou, A., Dallas, C., Papaki, E., Constantopoulos, P., Angelis, S., Baldwin, T., … Sjögren, B. (2013). *Deliverable D1.2 – State of the art report on digital research practices, tools and scholarly content use*. The Hague, Netherlands: Europeana Professional. Retrieved from http://pro.europeana.eu/europeana-cloud/europeana-cloud-project-documents
Berry, D. M. (2012). Introduction: understanding the digital humanities. In D. M. Berry (Ed.), *Understanding Digital Humanities* (pp. 1–20). Houndmills, Basingstoke, Hampshire ; New York: Palgrave Macmillan. Retrieved from DOI: 10.1057/9780230371934
Bertini, M., Del Bimbo, A., Ferracani, A., Gelli, F., Maddaluno, D., & Pezzatini, D. (2013a). A novel

framework for collaborative video recommendation, interest discovery and friendship suggestion based on semantic profiling. In *Proceedings of the 21st ACM International Conference on Multimedia* (pp. 451–452). New York, NY, USA: ACM. http://doi.org/10.1145/2502081.2502264

Bertini, M., Del Bimbo, A., Ferracani, A., Gelli, F., Maddaluno, D., & Pezzatini, D. (2013b). Socially-aware video recommendation using users' profiles and crowdsourced annotations. In *Proceedings of the 2Nd International Workshop on Socially-aware Multimedia* (pp. 13–18). New York, NY, USA: ACM. http://doi.org/10.1145/2509916.2509924

Bessière, I., & Gili, J. A. (Eds.). (2004). *Histoire du cinéma : Problématique des sources*. Paris: Institut National d'Histoire de l'Art; Maison des Sciences de l'Homme; Centre d'Etudes et de Recherches sur l'Histoire et l'Esthétique du Cinéma; Association Française de Recherce sur L'Histoire du Cinéma (AFRHC).

Bhaskar, M. (2011). Towards paracontent. *Logos*, *22*(1), 25–36. http://doi.org/10.1163/095796511X562617

Bianco, C. E. (2009). Medical librarians' uses and perceptions of social tagging. *Journal of the Medical Library Association : JMLA*, *97*(2), 136–139. http://doi.org/10.3163/1536-5050.97.2.012

Bod, R. (2013). Who's afraid of patterns?: the particular versus the universal and the meaning of humanities 3.0. *BMGN - Low Countries Historical Review*, *128*(4).

Bögel, T., Gius, E., Petris, M., & Strötgen, J. (2014). A collaborative, indeterministic and partly automatized approach to text annotation. Presented at the Digital Humanities 2014, Laussane, Switzerland. Retrieved from http://dharchive.org/paper/DH2014/Workshops-802.xml

Bolton, R., Faulkner, H., Peebles, P., & Vaudrey, M. (2005). Why indexing? *Indexer*, *24*(4), 171–173.

Bondi, M., & Lorés Sanz, R. (Eds.). (2014). *Abstracts in academic discourse: variation and change*. Bern : New York: Peter Lang AG, Internationaler Verlag der Wissenschaften.

Bordwell, D. (1991). *Making meaning: inference and rhetoric in the interpretation of cinema* (Reprint edition). Cambridge, Mass.: Harvard University Press.

Bordwell, D., & Thompson, K. (2003). *Film art: an introduction* (7th ed.). Mcgraw-Hill College.

Borlund, P. (2000a). *Evaluation of interactive information retrieval systems*. Åbo Akademi University, Åbo. Retrieved from http://ccc.ku.dk/employees/?id=20f85ea5-d78c-4c35-a162-8672762b835e&vis=publikation

Borlund, P. (2000b). Experimental components for the evaluation of interactive information retrieval systems. *Journal of Documentation*, *56*(1), 71–90.

Borlund, P. (2003). The IIR evaluation model: a framework for evaluation of interactive information retrieval systems. *Information Research*, *8*(3). Retrieved from http://informationr.net/ir/8-3/paper152.html

Borlund, P. (2012). *Interactive, task based information retrieval evaluation*. Presented at the Information Foraging Summer School, Nijmegen.

Borlund, P., & Ingwersen, P. (1997). The development of a method for the evaluation of interactive information retrieval systems. *Journal of Documentation*, *53*, 225–250.

Borlund, P., & Schneider, J. W. (2010). Reconsideration of the simulated work task situation: a context instrument for evaluation of information retrieval interaction (pp. 155–164). Presented at the IIiX '10, New York, NY, USA: ACM. http://doi.org/10.1145/1840784.1840808

Bouazza, A. (1989). Information user studies. In *Encyclopedia of library and information science* (Vol. 44, supp. 9, pp. 144–164). New York: M. Dekker.

Bowker, G. C., & Star, S. L. (2000). *Sorting things out: classification and its consequences*. Cambridge, Mass.: The MIT Press.

Bowman, J. H. (2007). Annotation: a lost art in cataloguing. *Cataloging & Classification Quarterly*, *44*(1-2), 95–111. http://doi.org/10.1300/J104v44n01_07

Bradley, J., & Vetch, P. (2007). Supporting Annotation as a Scholarly Tool—Experiences From the Online Chopin Variorum Edition. *Literary and Linguistic Computing*, *22*(2), 225–241. http://doi.org/10.1093/llc/fqm001

Brandón Antelo, A. (2012). *Descripción de documentos cinematográficos ¿Hacia la UNE EN 15907:2011?* (info:eu-repo/semantics/bachelorThesis). Salamanca, Spain. Retrieved from http://hdl.handle.net/10366/121120

Branigan, E., & Buckland, W. (Eds.). (2014). *The Routledge encyclopedia of film theory*. New York, NY:

Routledge, Taylor & Francis Group.
Brilliant, R. (1988). How an art historian connects art objects and information. *Library Trends*, *37*(2), 120–129.
Brisset, D. E. (2011). *Análisis fílmico y audiovisual*. Barcelona: Editorial UOC.
British Film Institute. (2015). What the archive contains. Retrieved October 22, 2015, from http://www.bfi.org.uk/archive-collections/about-bfi-national-archive/what-archive-contains
Bron, M. (2013). *Exploration and contextualization through interaction and concepts*. Universiteit van Amsterdam, Amsterdam. Retrieved from http://dare.uva.nl/record/459000
Bron, M., Gorp, J. van, & de Rijke, M. (2015). Media studies research in the data-driven age: How research questions evolve. *Journal of the Association for Information Science and Technology*, n/a–n/a. http://doi.org/10.1002/asi.23458
Brown, C. D. (2002). Straddling the humanities and social sciences: The research process of music scholars. *Library & Information Science Research*, *24*(1), 73–94.
Buckland, M. K. (1991). Information as thing. *Journal of the American Society for Information Science*, *42*(5).
Burford, B., Briggs, P., & Eakins, J. P. (2003). A taxonomy of the image: on the classification of content for image retrieval. *Visual Communication*, *2*(2), 123–161. http://doi.org/10.1177/1470357203002002001
Burnett, G., & Erdelez, S. (2010). Forecasting the next 10 years in information behavior research: a fish bowl dialogue. *Bulletin of the American Society for Information Science and Technology*, *36*(3), 44–48.
Burt, R. (2007). Getting schmedieval: of manuscript and film prologues, paratexts, and parodies. *Exemplaria*, *19*(2), 217–242. http://doi.org/10.1179/175330707X212840
Cantador, I., Szomszor, M., Alani, H., Fernández, M., & Castells, P. (2008). Enriching ontological user profiles with tagging history for multi-domain recommendations. Presented at the 1st International Workshop on Collective Semantics: Collective Intelligence; the Semantic Web (CISWeb 2008), Tenerife, Spain. Retrieved from http://oro.open.ac.uk/20015/
Caplan, P. (2003). *Metadata fundamentals: for all librarians*. American Library Association.
Carroll, N. (1996). *Theorizing the moving image*. Cambridge ; New York: Cambridge University Press.
Carter, T. M., & Levine-Clark, M. (2013). *ALA Glossary of Library and Information Science*. Chicago: ALA editions, an imprint of the American Library Association.
Case, D. O. (2007). *Looking for information: a survey of research on information seeking, needs, and behavior* (2nd ed). Amsterdam [etc.]: Academic Press.
Case, D. O. (2012). *Looking for Information : a survey of research on information seeking, needs and behavior / edited by Donald O. Case.* (3rd ed.). Bingley, UK: Emerald Group Pub. Retrieved from http://books.google.nl/books?id=XYX_RV7Wy9QC&lpg=PP1&dq=looking%20for%20information%20case%202013&pg=PA159#v=onepage&q&f=false
Casey B., S., & Mortimer, C. (2013). *Doing film studies: a subject guide for students*. London; New York: Routledge.
Castel, V. (2006). Generating abstracts from genre structure through lexicogrammar: Modelling of feature selection and mapping. *Revista Signos*, *39*(62). http://doi.org/10.4067/S0718-09342006000300001
Catarino, M. E., & Baptista, A. A. (2008). Relating folksonomies with Dublin Core (pp. 14–22). Presented at the International Conference on Dublin Core and Metadata Applications, Berlin. Retrieved from http://dcpapers.dublincore.org/index.php/pubs/article/view/915
Cattelan, R. G., Teixeira, C., Goularte, R., & Pimentel, M. D. G. C. (2008). Watch-and-comment as a paradigm toward ubiquitous interactive video editing. *ACM Transactions on Multimedia Computing, Communications, and Applications*, *4*(4), 1–24. http://doi.org/10.1145/1412196.1412201
Causer, T., Terras, M., & Hildebrand, M. (2014). "Many hands make light work. many hands together make merry work": transcribe Bentham and crowdsourcing manuscript collections. In M. Ridge (Ed.), *Crowdsourcing our Cultural Heritage* (pp. 161–184). Ashgate Publishing, Ltd.
Ceolin, D., Nottamkandath, A., & Fokkink, W. (2014). Efficient semi-automated assessment of annotations trustworthiness. *Journal of Trust Management*, *1*(1), 3. http://doi.org/10.1186/2196-

064X-1-3
Chapman, J., Glancy, M., & Harper, S. (Eds.). (2009). *The new film history: sources, methods, approaches*. Basingstoke, UK: Palgrave Macmillan.
Charmaz, K. (2006). *Constructing grounded theory: a practical guide through qualitative analysis*. London ; Thousand Oaks, Calif: SAGE Publications Ltd.
Charvat, J. (2003, June 30). Determine user requirements now to avoid problems later. Retrieved from http://www.techrepublic.com/article/determine-user-requirements-now-to-avoid-problems-later/
Chu, C. M., & O'Brien, A. (1993). Subject analysis: the critical first stage in indexing. *Journal of Information Science*, *19*(6), 439–454.
Clark, J. C. (2014). Information-seeking behavior and library use by distance education graduate music education students. *Music Reference Services Quarterly*, *17*(4), 207–225. http://doi.org/10.1080/10588167.2014.965606
Collins, E., Bulger, M. E., & Meyer, E. T. (2012). Discipline matters: technology use in the humanities. *Arts and Humanities in Higher Education*, *11*(1-2), 76–92. http://doi.org/10.1177/1474022211427421
Collins, E., & Jubb, M. (2012). How do researchers in the humanities use information resources? *Liber Quarterly: The Journal of European Research Libraries*, *21*(2), 176–187.
Connaway, L., & Snyder, C. (2005). Transaction log analyses of electronic book (ebook) usage. *Against the Grain*, *17*(1).
Constantopoulos, P., & Munson, M. (2013, September). *Scholarly methods ontology and DH resource portal: Breakout session*. Presented at the DARIAH General VCC Meeting, Copenhagen, Denmark. Retrieved from http://dariah.eu/fileadmin/Documents/ontologyDay1.pdf
Cool, C., & Belkin, N. J. (2002). A classification of interactions with information. In *Emerging frameworks and methods* (pp. 1–15). Greenwood Village, Colo.: Libraries Unlimited.
Corbin, J., & Strauss, A. (2015). *Basics of qualitative research: techniques and procedures for developing grounded theory* (4th edition). Los Angeles, California: SAGE Publications, Inc.
Cunningham, S. J., Reeves, N., & Britland, M. (2003). An ethnographic study of music information seeking: implications for the design of a music digital library. In *Proceedings of the 3rd ACM/IEEE-CS Joint Conference on Digital Libraries* (pp. 5–16). Washington, DC, USA: IEEE Computer Society. Retrieved from http://dl.acm.org/citation.cfm?id=827140.827142
Daily, J. E. (1967). The selection, processing, and storage of non-print materials: a critique of the anglo-american cataloging rules as they relate to newer media. *Library Trends*, *16*(2), 283–289.
Daily, J. E., & Hanson, E. R. (2009). Catalogs and cataloging: history. In *Encyclopedia of Library and Information Sciences* (3rd ed., pp. 818–854). New York: Taylor & Francis.
Darvish, S., & Chin, A. (2010). Dealing with the video tidal wave: the relevance of expertise for video tagging. In *Proceedings of the 21st ACM Conference on Hypertext and Hypermedia* (pp. 289–290). New York, NY, USA: ACM. http://doi.org/10.1145/1810617.1810679
Day, R. E. (2001). *The modern invention of information discourse, history, and power*. Carbondale: Southern Illinois University Press.
Day, R. E. (2014a). *Indexing it all: the subject in the age of documentation, information, and data*. Cambridge, Massachusetts: The MIT Press.
Day, R. E. (2014b). Value and the unseen producers: wages for housework in the women's movement in 1970s italy and the prosumers of digital capitalism. *The Information Society*, *31*(1), 36–43. http://doi.org/10.1080/01972243.2015.977632
De Boer, V., Hildebrand, M., Aroyo, L., Leenheer, P. D., Dijkshoorn, C., Tesfa, B., & Schreiber, G. (2012). Nichesourcing: harnessing the power of crowds of experts. In A. ten Teije, J. Völker, S. Handschuh, H. Stuckenschmidt, M. d'Acquin, A. Nikolov, … N. Hernandez (Eds.), *Ekaw'12: proceedings of the 18th international conference on knowledge engineering and knowledge management* (pp. 16–20). Berlin, Heidelberg: Springer-Verlag. Retrieved from http://doi.org/10.1007/978-3-642-33876-2_3
De Boer, V., Wielemaker, J., Gent, J. van, Hildebrand, M., Isaac, A., Ossenbruggen, J. van, & Schreiber, G. (2012). Supporting linked data production for cultural heritage institutes: the amsterdam museum case study. In E. Simperl, P. Cimiano, A. Polleres, O. Corcho, & V. Presutti (Eds.), *The Semantic Web: Research and Applications* (pp. 733–747). Springer Berlin Heidelberg. Retrieved from http://link.springer.com/chapter/10.1007/978-3-642-30284-8_56

DeCroix, R. (1997). A history of stock footage: changing definitions with changing times. In *Footage: The Worldwide Moving Image Sourcebook* (pp. A27–A30). New York: Second Line Search.
Decurtins, C., Norrie, M. C., & Signer, B. (2003). Putting the gloss on paper: a framework for cross-media annotation. *New Review of Hypermedia & Multimedia*, *9*(2), 35–57. http://doi.org/10.1080/13614560410001725301
De Keyser, P. (2012). The black art of indexing moving images. In *Indexing : From Thesauri to the Semantic Web* (pp. 101–112). Burlington: Elsevier Science.
De Schutter, E. (2015). The missing piece of the puzzle: neuroinformatics at the bench. *Neuroinformatics*, *13*(2), 131–132. http://doi.org/10.1007/s12021-015-9268-3
Desrochers, N., & Apollon, D. (Eds.). (2014). *Examining paratextual theory and its applications in digital culture*. United States: IGI Global.
Dijkshoorn, C., Oosterman, J., Aroyo, L., & Houben, G.-J. (2012). Personalization in Crowd-driven Annotation for Cultural Heritage Collections. Presented at the PATCH'2012 @ UMAP'2012. 4th International Workshop on Personalized Access to Cultural Heritage, Montreal, Canada. Retrieved from http://patch2012.wordpress.com/program/dijkshoorn-oosterman-aroyo-houben-patch-umap2012/
Ding, Y., Jacob, E. K., Zhixiong Zhang, Foo, S., Erjia Yan, George, N. L., & Lijiang Guo. (2009). Perspectives on social tagging. *Journal of the American Society for Information Science & Technology*, *60*(12), 2388–2401. http://doi.org/10.1002/asi.21190
Doan, A., Ramakrishnan, R., & Halevy, A. Y. (2011). Crowdsourcing systems on the World-Wide Web. *Communications of the ACM*, *54*(4), 86. http://doi.org/10.1145/1924421.1924442
Dombrowski, Q. (2014). What ever happened to Project Bamboo? *Literary and Linguistic Computing*, *29*(3), 326–339. http://doi.org/10.1093/llc/fqu026
Dong, W., & Fu, W.-T. (2010). Cultural difference in image tagging. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 981–984). New York, NY, USA: ACM. http://doi.org/10.1145/1753326.1753472
Dougan, K. (2015). Finding the right notes: an observational study of score and recording seeking behaviors of music students. *Journal of Academic Librarianship*, *41*(1), 61–67. http://doi.org/10.1016/j.acalib.2014.09.013
Downing, J. D. H., Schlesinger, P., Wartella, E., & McQuail, D. (Eds.). (2004). *The Sage handbook of media studies*. Thousand Oaks, CA: SAGE Publications, Inc.
Dunning, A. (2015). About Europeana Cloud. Retrieved May 15, 2015, from http://pro.europeana.eu/europeana-cloud/about-europeana-cloud
Eakins, J. P., Briggs, P., & Burford, B. (2004). Image retrieval interfaces: A user perspective. In P. G. B. Enser, Y. Kompatsiaris, N. E. O'Connor, A. F. Smeaton, & A. W. M. Smeulders (Eds.), *Image and Video Retrieval* (pp. 628–637). Springer Berlin Heidelberg.
EBU Technical. (2010). *EBU archives report*. EBU [European Broadcasting Union]. Retrieved from http://www.avarchivering.nl/node/1056?loc=kennisbank%2F60
EBU Technical. (2014). EBU Core metadata set (EBUCore). TECH 3293, version 1.5. EBU [European Broadcasting Union]. Retrieved from http://www.avarchivering.nl/node/1056?loc=kennisbank%2F60
Eccles, K. E., & Greg, A. (2014). Your paintings tagger: Crowdsourcing descriptive metadata for a national virtual collection. In M. Ridge (Ed.), *Crowdsourcing our Cultural Heritage* (pp. 185–208). Ashgate Publishing, Ltd.
Edmond, J., Garnett, V., & Benardou, A. (2014). *So we've built it, but have they come? Investigating barriers and opportunities for API usage among the AHSS community* (Workshop No. Europeana Cloud WP1). The Hague, Netherlands: Europeana Professional. Retrieved from http://pro.europeana.eu/europeana-cloud/about-europeana-cloud
Eisenberg, M. B., & Berkowitz, R. E. (1990). *Information problem-solving: the Big Six skills approach to library & information skills instruction*. Norwood, NJ: Ablex Publishing Corporation.
Ellis, D. (1989). A behavioral approach to information retrieval system design. *Journal of Documentation*, *45*(3), 171–212. http://doi.org/10.1108/eb026843
Ellis, D. (2005). Ellis's model of information-seeking behavior. In K. E. Fisher, S. Erdelez, & L. McKechnie (Eds.), *Theories of Information Behavior* (pp. 138–142). Information Today, Inc.

Elsaesser, T. (1986). The new film history. *Sight & Sound*, (4), 246–251.
Encyclopedia Britannica. (2015). Retrieved from http://www.britannica.com/art/motion-picture
Enser, P. G. B. (2000). Visual image retrieval: seeking the alliance of concept-based and content-based paradigms. *Journal of Information Science*, *26*(4), 199–210. http://doi.org/10.1177/016555150002600401
Enser, P. G. B. (2008a). The evolution of visual information retrieval. *Journal of Information Science*, *34*(4), 531–546. http://doi.org/10.1177/0165551508091013
Enser, P. G. B. (2008b). Visual image retrieval. In *Annual Review of Information Science and Technology* (Vol. 42, pp. 1–42). Retrieved from 10.1002/aris.2008.1440420108
Enser, P. G. B., & Sandom, C. (2002). Retrieval of archival moving imagery: CBIR outside the frame? In M. S. Lew, N. Sebe, & J. P. Eakins (Eds.), *Image and Video Retrieval* (pp. 206–214). Springer Berlin Heidelberg. Retrieved from http://link.springer.com/chapter/10.1007/3-540-45479-9_22
Estabrook, L. S. (2009). Library and information science. In *Encyclopedia of Library and Information Sciences* (3rd ed., pp. 3287–3292). New York: Taylor & Francis.
Esteban, M.-J. de. (2012). ReGenreNation: the revision of genres at the British Film Institute. *Catalogue & Index*, (166), 19–23.
Eunews. (2013, July 12). The "Europa Film Treasures" website, financed also by the EU, disappears - Eunews. Retrieved from http://www.eunews.it/en/2013/07/12/the-europa-film-treasures-website-financed-also-by-the-eu-disappears-2/8370
Europeana. (2014). *Europeana strategy 2020: "We transform the world with culture."* Retrieved from http://strategy2020.europeana.eu/
EUscreenXL. (2013). *Grant agreement for: CIP-Best practice network. Annex I - "Description of work"* (Internal document No. CIP-ICT-PSP-2012-6).
Ewerth, R., Mühling, M., Stadelmann, T., Gllavata, J., Grauer, M., & Freisleben, B. (2009). Videana: a software toolkit for scientific film studies. In M. Ross, M. Grauer, & B. Freisleben (Eds.), *Digital Tools in Media Studies: Analysis and Research : an Overview* (pp. 101–116). Bielefeld: Transcript Verlag.
Fan, W., Wang, T., Bouguet, J., Hu, W., Zhang, Y., & Yeung, D.-Y. (2006). Semi-supervised cast indexing for feature-length films. In T.-J. Cham, J. Cai, C. Dorai, D. Rajan, T.-S. Chua, & L.-T. Chia (Eds.), *Advances in Multimedia Modeling* (pp. 625–635). Springer Berlin Heidelberg. Retrieved from http://link.springer.com/chapter/10.1007/978-3-540-69423-6_61
Farquhar, A., Fikes, R., & Rice, J. (1997). The Ontolingua Server: a tool for collaborative ontology construction. *International Journal of Human-Computer Studies*, *46*(6), 707–727. http://doi.org/10.1006/ijhc.1996.0121
Fédération Internationale des Archives du Film. (2015). Links to the FIAF affiliates. Retrieved November 1, 2015, from http://www.fiafnet.org/uk/members/links.html
Fidel, R. (1997). The image retrieval task: implications for the design and evaluation of image databases. *The New Review of Hypermedia and Multimedia*, *3*. http://doi.org/10.1080/13614569708914689
Fidel, R. (2012). *Human information interaction an ecological approach to information behavior*. Cambridge, Mass.: MIT Press.
Filmstandards.org. (2011a). EN 15907 Content. Retrieved June 9, 2015, from http://filmstandards.org/fsc/index.php/EN_15907_Content
Filmstandards.org. (2011b). How EN 15744 and EN 15907 came into being. Retrieved June 9, 2015, from http://filmstandards.org/fsc/index.php/How_EN_15744_and_EN_15907_came_into_being
Fisher, K. E., Erdelez, S., & McKechnie, L. (2005). *Theories of Information Behavior*. Information Today, Inc.
Flanders, J., & Mylonas, E. (2009). Digital humanities. In *Encyclopedia of Library and Information Sciences* (3rd ed., pp. 1557–1568). New York: Taylor & Francis.
Fleischer, N., & Backe, A. K. (2011). Just tag it! In *Changing sceneries, changing roles: new challenges in the audiovisal archiving digital domain (selected papers)* (Vol. Part V). Toronto: FIAT/IFTA.
Fludernik, M. (2000). Genres, text types, or discourse modes? Narrative modalities and generic categorization. *Style*, *34*(2), 274.
Fogli, D., Fresta, G., & Mussio, P. (2004). On electronic annotation and its implementation. In

Proceedings of the Working Conference on Advanced Visual Interfaces (pp. 98–102). New York, NY, USA: ACM. http://doi.org/10.1145/989863.989877
Foskett, A. C. (1977). *The subject approach to information*. London; Hamden, Conn.: Bingley ; Linnet Books.
Fossati, G. (2009). *From grain to pixel: the archival life of film in transition*. Amsterdam University Press.
Fossati, G., & Smith, C. (2012). An interview with Giovanna Fossati, film archivist and curator. *Moving Image Archive News: A Clearinghouse of Information on Film Archiving and Related Endeavors*. Retrieved from http://www.movingimagearchivenews.org/an-interview-with-giovanna-fossati-film-archivist-and-curator/
Foster, A. E., & Ellis, D. (2014). Serendipity and its study. *Journal of Documentation*, *70*(6), 1015–1038. http://doi.org/10.1108/JD-03-2014-0053
Fox, M., & Reece, A. (2013). The impossible decision: social tagging and Derrida's deconstructed hospitality. *NASKO*, *4*(1), 53–69. http://doi.org/10.7152/nasko.v4i1.14645
Fredkin, E. (1967). Film indexing method and apparatus for high speed film reading. Retrieved from http://www.google.nl/patents/US3339815
Freiburg, B., Kamps, J., & Snoek, C. G. M. (2011). Crowdsourcing visual detectors for video search. In *Proceedings of the 19th ACM international conference on Multimedia* (pp. 913–916). New York, NY, USA: ACM. http://doi.org/10.1145/2072298.2071901
Fry, J., & Talja, S. (2007). The intellectual and social organization of academic fields and the shaping of digital resources. *Journal of Information Science*, *33*(2), 115–133. http://doi.org/10.1177/0165551506068153
Fujita, sumio. (2000). *Reflections on "aboutness": TREC-9 Evaluation experiments at Justsystem*. Presented at the Text Retrieval Conference (TREC), Gaithersburg, Maryland. Retrieved from http://trec.nist.gov/pubs/trec9/papers/jscbt9w_paper.pdf
Furner, J. (2009). Folksonomies. In *Encyclopedia of Library and Information Sciences* (3rd ed., pp. 1858–1866). New York: Taylor & Francis.
Fu, W.-T., Kannampallil, T., Kang, R., & He, J. (2010). Semantic imitation in social tagging. *ACM Transactions on Computer-Human Interaction*, *17*(3), 12:1–12:37. http://doi.org/10.1145/1806923.1806926
Fu, X., Ciszek, T., Marchionini, & Solomon, P. (2005). Annotating the web: an exploratory study of web users' needs for personal annotation tools. *Proceedings of the American Society for Information Science and Technology*, *42*(1). http://doi.org/10.1002/meet.14504201151
Gao, F. (2013). A case study of using a social annotation tool to support collaboratively learning. *Internet & Higher Education*, *17*, 76–83.
Gedikli, F., & Jannach, D. (2013). Improving recommendation accuracy based on item-specific tag preferences. *ACM Transactions on Intelligent Systems and Technology*, *4*(1), 11:1–11:19. http://doi.org/10.1145/2414425.2414436
Geisler, G., Willard, G., & Ovalle, C. (2011). A crowdsourcing framework for the production and use of film and television data. *New Review of Hypermedia and Multimedia*, *17*(1), 73–97. http://doi.org/10.1080/13614568.2011.552645
Geisler, G., Willard, G., & Whitworth, E. (2010). Crowdsourcing the indexing of film and television media. In *Proceedings of the 73rd ASIS&T Annual Meeting on Navigating Streams in an Information Ecosystem* (pp. 82:1–82:10). Silver Springs, MD, USA: American Society for Information Science. Retrieved from http://dl.acm.org/citation.cfm?id=1920331.1920448
Genette, G. (1992). *The architext: an introduction*. Berkeley: University of California Press.
Genette, G. (1997a). *Palimpsests: literature in the second degree*. U of Nebraska Press.
Genette, G. (1997b). *Paratexts: thresholds of interpretation*. (J. E. Lewin, Trans.). Cambridge ; New York, NY, USA: Cambridge University Press.
Gerber, A., Hyland, A., & Hunter, J. (2010). A collaborative scholarly annotation system for dynamic web documents – a literary case study. In G. Chowdhury, C. Koo, & J. Hunter (Eds.), *The Role of Digital Libraries in a Time of Global Change* (pp. 29–39). Springer Berlin Heidelberg.
Gherab-Martín, K. (2011). Digital repositories, folksonomies, and interdisciplinary research: new social epistemology tools. In *The Handbook of Emergent Technologies in Social Research*. New York:

Oxford University Press.
Ghorbel, H., & Jacot, D. (2011). Further experiments in sentiment analysis of french movie reviews. In E. Mugellini, P. S. Szczepaniak, M. C. Pettenati, & M. Sokhn (Eds.), *Advances in Intelligent Web Mastering – 3* (Vol. 86, pp. 19–28). Berlin, Heidelberg: Springer Berlin Heidelberg. Retrieved from http://link.springer.com/10.1007/978-3-642-18029-3_3
Gibbon, D. C., Liu, Z., Basso, A., & Shahraray, B. (2013). Automated content metadata extraction services based on MPEG standards. *Computer Journal*, *56*(5), 628–645. http://doi.org/10.1093/comjnl/bxs146
Giles, J. (2012). Going paperless: The digital lab. *Nature News*, *481*(7382), 430. http://doi.org/10.1038/481430a
Gligorov, R., Hildebrand, M., van Ossenbruggen, J., Aroyo, L., & Schreiber, G. (2013). An evaluation of labelling-game data for video retrieval. In P. Serdyukov, P. Braslavski, S. O. Kuznetsov, J. Kamps, S. Rüger, E. Agichtein, … E. Yilmaz (Eds.), *Advances in Information Retrieval* (pp. 50–61). Springer Berlin Heidelberg.
Gligorov, R., Hildebrand, M., van Ossenbruggen, J., Schreiber, G., & Aroyo, L. (2011). On the role of user-generated metadata in audio visual collections (pp. 145–152). Presented at the K-CAP '11, New York, NY, USA: ACM. http://doi.org/10.1145/1999676.1999702
Goddard, C. (2011). *Semantic Analysis: a practical introduction* (2nd ed.). New York: Oxford University Press.
Goh, D. H.-L., Ang, R. P., Lee, C. S., & Chua, A. Y. K. (2011). Fight or unite: Investigating game genres for image tagging. *Journal of the American Society for Information Science and Technology*, *62*(7), 1311–1324. http://doi.org/10.1002/asi.21478
Goh, D. H.-L., & Lee, C. S. (2011). Perceptions, quality and motivational needs in image tagging human computation games. *Journal of Information Science*, *37*(5), 515–531. http://doi.org/10.1177/0165551511417786
Golbeck, J., Koepfler, J., & Emmerling, B. (2011). An experimental study of social tagging behavior and image content. *Journal of the American Society for Information Science and Technology*, *62*(9), 1750–1760. http://doi.org/10.1002/asi.21522
Golder, S. A., & Huberman, B. A. (2006). Usage patterns of collaborative tagging systems. *Journal of Information Science*, *32*(2), 198–208. http://doi.org/10.1177/0165551506062337
Good, B. M., Tennis, J. T., & Wilkinson, M. D. (2009). Social tagging in the life sciences: characterizing a new metadata resource for bioinformatics. *BMC Bioinformatics*, *10*, 313–313. http://doi.org/10.1186/1471-2105-10-313
Gradmann, S. (2013). From containers to content to context. *Journal of Documentation*, *70*(2), 241–260. http://doi.org/10.1108/JD-05-2013-0058
Gray, J. (2010). *Show sold separately: promos, spoilers, and other media paratexts*. New York: NYU Press.
Greenberg, J. (2009). Metadata and digital information. In *Encyclopedia of Library and Information Sciences* (3rd ed., pp. 1858–1866). New York: Taylor & Francis.
Groth, P., Gibson, A., & Velterop, J. (2010). The anatomy of a nanopublication. *Information Services & Use*, *30*(1-2), 51–56.
Gupta, M., Li, R., Yin, Z., & Han, J. (2010). Survey on social tagging techniques. *ACM SIGKDD Explorations Newsletter*, *12*(1), 58–72. http://doi.org/10.1145/1882471.1882480
Guy, M., & Tonkin, E. (2006). Folksonomies: tidying up tags? *D-Lib Magazine*, *12*(1). Retrieved from http://webdoc.sub.gwdg.de/edoc/aw/d-lib/dlib/january06/guy/01guy.html
Guynn, W. (Ed.). (2010). The stages of the film production process. In *The Routledge Companion to Film History* (pp. 39–63). Hoboken: Taylor and Francis. Retrieved from http://www.uunl.eblib.com/patron/FullRecord.aspx?p=589605
Halpin, H., Robu, V., & Shepherd, H. (2007). The complex dynamics of collaborative tagging. In *Proceedings of the 16th international conference on World Wide Web* (pp. 211–220). New York, NY, USA: ACM. http://doi.org/10.1145/1242572.1242602
Hammond, T., Hannay, T., Lund, B., & Scott, J. (2005). Social bookmarking tools (i): a general review. *D-Lib Magazine*, *11*(04). http://doi.org/10.1045/april2005-hammond
Harrison, H., & FIAF Cataloguing Commission. (1991). *The FIAF cataloguing rules for film archives*.

München; New York: K.G. Saur.
Hartley, J. (2011). *Communication, cultural and media studies: the key concepts* (4 edition). Abingdon, Oxon ; New York: Routledge.
Haslhofer, B., Jochum, W., King, R., Sadilek, C., & Schellner, K. (2009). The LEMO annotation framework: weaving multimedia annotations with the web. *International Journal on Digital Libraries*, *10*(1), 15–32. http://doi.org/http://dx.doi.org/10.1007/s00799-009-0050-8
Hastreiter, I., Burghardt, M., Elsweiler, D., & Wolff, C. (2013). Digitale Annotation im akademischen Kontext : Empirische Untersuchung zur Annotationspraxis von Studierenden auf Tablet-Computern. In C. Hobohm (Ed.), *Informationswissenschaft zwischen virtueller Infrastruktur und materiellen Lebenswelten : Information Science between Virtual Infrastructre and Material Lifeworlds* (pp. 118–129). Glückstadt: Hülsbusch. Retrieved from http://opus4.kobv.de/opus4-fhpotsdam/frontdoor/index/index/docId/402
Hauttekeete, L., Evens, T., De Moor, K., Schuurman, D., Mannens, E., & Van de Walle, R. (2011). Archives in motion: concrete steps towards the digital disclosure of audiovisual content. *Journal of Cultural Heritage*, *12*(4), 459–465. http://doi.org/10.1016/j.culher.2011.04.004
Heckner, M., Mühlbacher, S., & Wolff, C. (2008). Tagging tagging: Analysing user keywords in scientific bibliography management systems. *Journal of Digital Information*, *9*(2), 3–3.
Heftberger, A. (2012). Do computers dream of cinema? Film data for computer analysis and visualization. In D. M. Berry (Ed.), *Understanding Digital Humanities* (pp. 1–20). Houndmills, Basingstoke, Hampshire ; New York: Palgrave Macmillan.
Hemmig, W. (2009). An empirical study of the information-seeking behavior of practicing visual artists. *Journal of Documentation*, *65*(4), 682–703.
Hemmig, W. S. (2008). The information-seeking behavior of visual artists: A literature review. *Journal of Documentation*, *64*(3), 343–362. http://doi.org/10.1108/00220410810867579
Hemminger, B. M., & TerMaat, J. (2014). Annotating for the world: attitudes toward sharing scholarly annotations. *Journal of the Association for Information Science & Technology*, *65*(11), 2278–2292.
Hennicke, S., Olensky, M., de Boer, V., Isaac, A., & Wielemaker, J. (2011). Conversion of EAD into EDM linked data. In *CEUR Workshop Proceedings* (Vol. 801, pp. 82–88). Berlin.
Hernández, T. (2011). La documentación audiovisual. In M. [et al] C. Sebastián, T. Hernández, D. Rodríguez, & B. Pérez, *Documentación Audiovisual* (pp. 19–43). Madrid: Editorial Síntesis, S. A.
Hertzum, M. (2003). Requests for information from a film archive: a case study of multimedia retrieval. *Journal of Documentation*, *59*(2), 168–186. http://doi.org/10.1108/00220410310463473
Hertzum, M., Mark Pejtersen, A., Cleal, B., & Albrechtsen, H. (2002). An analysis of collaboration in three film archives: a case for collaboratories. In *Emerging frameworks and methods* (pp. 85–107). Greenwood Village, Colo.: Libraries Unlimited.
Hewett, R., & Barber, S. (Eds.). (2013). Audiovisual citation: BUFVC guidelines for referencing moving image and sound. British Universities Film & Video Council.
Heymann, P., & Garcia-Molina, H. (2009). Contrasting controlled vocabulary and tagging: do experts choose the right names to label the wrong things? (pp. 1–4). Presented at the Second ACM International Conference on Web Search and Data Mining (WSDM 2009), Late Breaking Results Session, Barcelona, Spain: Stanford InfoLab. Retrieved from http://ilpubs.stanford.edu:8090/955/
Hidderley, R., & Rafferty, P. (1997). Democratic indexing: an approach to the retrieval of fiction. *Information Services and Use - Special Issue: Electronic Access to Fiction*, *17*(2-3), 101–109.
Hildebrand, M., Brinkerink, M., Gligorov, R., van Steenbergen, M., Huijkman, J., & Oomen, J. (2013). Waisda? Video labeling game. Presented at the ACM Multimedia, Barcelona.
Hildebrand, M., van Ossenbruggen, J., Hardman, L., & Jacobs, G. (2009). Supporting subject matter annotation using heterogeneous thesauri. *International Journal of Human-Computer Studies*, *67*(10), 887–902. http://doi.org/10.1016/j.ijhcs.2009.07.008
Hjørland, B. (1997). *Information seeking and subject representation: an activity-theoretical approach to information science*. Westport, Conn: Praeger.
Hjørland, B. (2006). Content. Retrieved October 14, 2015, from http://www.iva.dk/bh/Core%20Concepts%20in%20LIS/articles%20a-z/content.htm
Hjørland, B. (2008). Knowledge organization systems (KOS). Retrieved October 14, 2015, from http://www.iva.dk/bh/Core%20Concepts%20in%20LIS/articles%20a-z/content.htm

Höffernig, M., & Bailer, W. (2009). Formal metadata semantics for interoperability in the audiovisual media production process (Vol. 539, pp. 70–80). Presented at the CEUR Workshop Proceedings.
Höffernig, M., Bailer, W., Nagler, G., & Mülner, H. (2011). *Mapping audiovisual metadata formats using formal semantics* (Vol. 6725 LNCS).
Hollink, L. (2006). *Semantic annotation for retrieval of visual resources* (Doctoral Dissertation). Vrije Universiteit, Amsterdam. Retrieved from http://hdl.handle.net/1871/10846
Hollink, L., Schreiber, G., Wielinga, B. J., & Worring, M. (2004). Classification of user image descriptions. *International Journal of Human-Computer Studies*, *61*(5), 601–626. http://doi.org/10.1016/j.ijhcs.2004.03.002
Hollink, L., Worring, M., & Schreiber, G. (2005). Building a visual ontology for video retrieval. In *Proceedings of the 13th annual ACM international conference on Multimedia* (p. 479). ACM Press. http://doi.org/10.1145/1101149.1101256
Howe, J. (2006). The rise of crowdsourcing. *Wired*, (14). Retrieved from http://archive.wired.com/wired/archive/14.06/crowds.html
Huang, C., Fu, T., & Chen, H. (2010). Text-based video content classification for online video-sharing sites. *Journal of the American Society for Information Science and Technology*, *61*(5), 891–906. http://doi.org/10.1002/asi.21291
Huang, X., Soergel, D., & Klavans, J. L. (2015). Modeling and analyzing the topicality of art images. *Journal of the Association for Information Science and Technology*, *66*(8), 1616–1644. http://doi.org/10.1002/asi.23281
Hudelist, M. A., Schoeffmann, K., & Xu, Q. (2015). Improving interactive known-item search in video with the keyframe navigation tree. In X. He, S. Luo, D. Tao, C. Xu, J. Yang, & M. A. Hasan (Eds.), *MultiMedia Modeling* (pp. 306–317). Springer International Publishing.
Hudon, M. (2004). Conceptual and lexical compatibility in thesauri used to describe and access moving image collections. In *L'accès à l'information : technologies, compétences et contexte socio-politique. Actes du 32e congrès annuel de l'Association canadienne des sciences de l'information, CAIS/ACSI*. Winnipeg: Canadian Association for Information Science (CAIS/ACSI). Retrieved from http://www.cais-acsi.ca/proceedings/2004/hudon_2004.pdf
Humanities. (2015). In *Encyclopaedia Britannica Online*. Retrieved from http://www.britannica.com/EBchecked/topic/276026/humanities
Hunter, J. (2001). An overview of the MPEG-7 description definition language (DDL). *IEEE Transactions on Circuits and Systems for Video Technology*, *11*(6), 765–772. http://doi.org/10.1109/76.927438
Hunter, J. (2009). Collaborative semantic tagging and annotation systems. *Annual Review of Information Science and Technology*, *43*(1), 1–84. http://doi.org/10.1002/aris.2009.1440430111
Hutchins, W. J. (1978). The concept of "aboutness" in subject indexing. In *Aslib Proceedings* (Vol. 30–5).
Huurnink, B., Hollink, L., van den Heuvel, W., & de Rijke, M. (2010). Search behavior of media professionals at an audiovisual archive: A transaction log analysis. *Journal of the American Society for Information Science and Technology*, *61*(6), 1180–1197. http://doi.org/10.1002/asi.21327
Huurnink, B., Snoek, C. G. M., de Rijke, M., & Smeulders, A. W. M. (2010). Today's and tomorrow's retrieval practice in the audiovisual archive (pp. 18–25). Presented at the CIVR '10, New York, NY, USA: ACM. http://doi.org/10.1145/1816041.1816045
Huvila, I. (2014). Archives, libraries and museums in the contemporary society: perspectives of the professionals (pp. 45–64). Presented at the iConference, Berlin. http://doi.org/10.9776/14032
IFLA Study Group on the Functional Requirements for Bibliographic Records. (2009). *Functional Requirements for Bibliographic Records*. International Federation of Library Associations and Institutions.
IFLA Working Group on the Functional Requirements for Subject Authority Records (FRSAR). (2010). *Functional Requirements for Subject Authority Data (FRSAD): A conceptual model* (p. 75). International Federation of Library Associations and Institutions.
Images for the Future. (2009). Waisda? Video labeling game: evaluation report. Retrieved from http://research.imagesforthefuture.org/index.php/waisda-video-labeling-game-evaluation-report/
IMDB.com, Inc. (2015a). Submission guide: plot outlines. Retrieved November 5, 2015, from http://www.imdb.com/updates/guide/outlines

IMDB.com, Inc. (2015b). Synopsis Help. Retrieved November 5, 2015, from http://www.imdb.com/swiki/special?SynopsisHelp#.2.1.1
Ingwersen, P. (1992). *Information retrieval interaction*. London: Taylor Graham.
Ingwersen, P. (1996). Cognitive perspectives of information retrieval interaction: elements of a cognitive ir theory. *Journal of Documentation*, *52*(1), 3–50. http://doi.org/10.1108/eb026960
Ingwersen, P. (2001). Cognitive lnformation Retrieval. In M. Williams (Ed.), *Annual Review of Information Science and Technology* (Vol. 34, pp. 3–51).
Ingwersen, P. (2002). Cognitive perspectives of document representation. In *Emerging frameworks and methods: Proceedings of the 4th international conference on conceptions of library and information science (CoLIS 4)* (pp. 21–25). Greenwood Village, Colo.: Libraries Unlimited.
Ingwersen, P. (2005). Integrative framework for information seeking and interactive information retrieval. In K. E. Fisher, S. Erdelez, & L. McKechnie (Eds.), *Theories of Information Behavior* (pp. 215–220). Information Today, Inc.
Ingwersen, P. (2012a). Citations and references as keys to relevance ranking in interactive ir. In *Proceedings of the 4th Information Interaction in Context Symposium*. New York, NY, USA: ACM. http://doi.org/10.1145/2362724.2362726
Ingwersen, P. (2012b). *Scientometric indicators and webometrics and the polyrepresentation principle in information retrieval*. Ess Ess Publications.
Ingwersen, P., & Järvelin, K. (2005). *The turn: Integration of information seeking and retrieval in context*. The Netherlands: Springer.
Ingwersen, P., & Pejtersen, A. M. (1986). User requirements: empirical research and information systems design. In P. Ingwersen, L. Kajberg, & A. M. Pejtersen (Eds.), *Information Technology and Information Use: Towards a Unified View of Information and Information Technology* (pp. 111–124). London, UK, UK: Taylor Graham Publishing.
Inskip, C., MacFarlane, A., & Rafferty, P. (2008). Content or context?: searching for musical meaning in task-based interactive information retrieval. In *Proceedings of the Second International Symposium on Information Interaction in Context* (pp. 72–74). New York, NY, USA: ACM. http://doi.org/10.1145/1414694.1414711
International Federation of Film Archives. (2014, November). FIAF moving image cataloguing manual (working draft). Filmstandards.org.
International Federation of Film Archives. (2015). FIAF statutes and rules (incorporating amendments ratified by the general assembly in cranberra on 18 april 2015). Retrieved from http://www.fiafnet.org/pdf/STATUTESandRULES.pdf
International Organizational for Standardization. (2013). Information technology: Procedures for achieving metadata registry content consistency. Part 6: Framework for generating ontologies (SO/IEC TR20943-6).
International Working Group on FRBR and CIDOC CRM Harmonisation. (2015). FRBR: object-oriented definition and mapping from FRBRER, FRAD and FRSAD (version 2.2). (C. Bekiari, M. Doerr, P. Le Boef, & P. Riva, Eds.).
Interoperable annotations for the arts and humanities, colloquium. (2013). Retrieved February 22, 2015, from http://calenda.org/266279
Intner, S. S., Swanson, E., & Intner, S. S. (2011). *Subject access to films & videos*. Santa Barbara, Calif.: Libraries Unlimited.
Jacob, E. K., & Shaw, D. (1998). Sociocognitive perspectives on representation. *Annual Review of Information Science and Technology (ARIST)*, *33*, 131–185. http://doi.org/10.1002/aris.1440360103
Jeavons, C. (2007). The moving image: subject or object? *Journal of Film Preservation*, (73), 19–32.
Jensen, K. B. (2008). Intermediality. In W. Donsbach (Ed.), *The International Encyclopedia of Communication*. International Communication Association (ICA) and Wiley-Blackwell. Retrieved from http://www.communicationencyclopedia.com/public/tocnode?id=g9781405131995_yr2013_chunk_g978140513199514_ss60-1
Jespersen, J., & Jespersen, H. (2004). The problems of subject access to visual materials. *Journal of Educational Media & Library Sciences*, *42*(1), 37–48.

Jong, A. de. (2003). Metadata in the audiovisual production environment: an introduction. Neerlands Instituut voor Beeld en Geluid. Retrieved from https://prestocentre.org/library/resources/metadata-audiovisual-production-environment

Jonkman, R. (2007). Any ID? Building a database out of the Jean Desmet archive. In F. Kessler & N. Verhoeff (Eds.), *Networks of Entertainment: Early Film Distribution 1895-1915*. Indiana University Press.

Jörgensen, C. (2003). *Image retrieval: theory and research*. Lanham, Md: Scarecrow Press.

Jörgensen, C. (2009). Still image indexing. In *Encyclopedia of Library and Information Sciences* (3rd ed., pp. 5012–5021). New York: Taylor & Francis.

Jurafsky, D., & Martin, J. H. (2008). *Speech and language processing: an introduction to natural language processing, computational linguistics and speech recognition* (2nd ed.). Upper Saddle River, N.J.: Prentice Hall.

Kakali, C., & Papatheodorou, C. (2010). Exploitation of folksonomies in subject analysis. *Library & Information Science Research*, *32*(3), 192–202.

Kaminski, J., Echavarria, K. R., Arnold, D., Palma, G., Scopigno, R., Proesmans, M., & Stevenson, J. (2012). Insourcing, outsourcing and crowdsourcing 3D collection formation: perspectives for cultural heritage sites. In *Insourcing, Outsourcing and Crowdsourcing 3D Collection Formation: Perspectives for Cultural Heritage Sites*. The Eurographics Association. Retrieved from http://dx.doi.org/10.2312/VAST/VAST12/081-088

Kang, R., & Fu, W.-T. (2010). Exploratory information search by domain experts and novices. In *Proceedings of the 15th international conference on Intelligent user interfaces* (pp. 329–332). New York, NY, USA: ACM. http://doi.org/10.1145/1719970.1720023

Kari, J. (2010). Diversity in the conceptions of information use. *Information Research*, *15*(3). Retrieved from http://www.informationr.net/ir/15-3/colis7/colis709.html

Kelly, D. (2009). Methods for evaluating interactive information retrieval systems with users. *Foundations and Trends in Information Retrieval*, *3*(1-2), 1–224. http://doi.org/10.1561/1500000012

Kemman, M., Kleppe, M., & Scagliola, S. (2014). Just Google it: digital research practices of humanities scholars. In *Proceedings of the Digital Humanities Congress 2012. Studies in the Digital Humanities*. Sheffield: HRI Online Publications. Retrieved from http://arxiv.org/abs/1309.2434

Kessler, F., & Lenk, S. (2014). Pourquoi et comment fait on l'histoire du cinéma? Presented at the Filmforum: International Film Studies Conference / MAGIS -International Film Studies Spring School, Udine, Gorizia. Retrieved from http://www.filmforumfestival.it/2014/03/17/pourquoi-et-comment-fait-on-lhistoire-du-cinema/

Kessler, F., & Lenk, S. (2015). *The individual film in cinema history: does it matter?* Presented at the What is Cinema History Conference, Glasgow. Retrieved from http://earlycinema.gla.ac.uk/wp-content/uploads/2015/02/What-is-Cinema-History-Programme-Final.pdf

Kim, H. H., & Kim, Y. H. (2010). Toward a conceptual framework of key-frame extraction and storyboard display for video summarization. *Journal of the American Society for Information Science and Technology*, *61*(5), 927–939. http://doi.org/10.1002/asi.21317

Kim, S. (2013). An exploratory study of user-centered indexing of published biomedical images. *Journal of the Medical Library Association (JMLA)*, *101*(1), 73–76.

Kim, Y.-M., & Rieh, S. Y. (2011). User perceptions of the role and value of tags. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 671–674). New York, NY, USA: ACM. http://doi.org/10.1145/1978942.1979039

King, K. E., & Gracy, K. F. (2009). Film and broadcast archives. In *Encyclopedia of Library and Information Sciences* (3rd ed., pp. 1834–1852). Taylor & Francis.

Kipp, M. (2014). Anvil: the video annotation research tool. In J. Durand, U. Gut, & G. Kristoffersen (Eds.), *The Oxford Handbook of Corpus Phonology*. Oxford: Oxford University Press.

Kipp, M. E. I. (2011). Controlled vocabularies and tags: An analysis of research methods. *NASKO*, *3*(1), 23–32.

Kirkegaard, B. (2008). *Metadata elements preferred in searching and assessing relevance of archived television broadcast by scholars and students in media studies : Nordicom*. Royal School of Library and Information Science, Aalborg. Retrieved from

http://nordicom.statsbiblioteket.dk/ncom/en/publications/metadata-elements-preferred-in-searching-and-assessing-relevance-of-archived-television-broadcast-by-scholars-and-students-in-media-studies(75c32460-c80f-11dc-838e-000ea68e967b).html
Kirkegaard, B. (2009). User needs in television archive access: acquiring knowledge necessary for system design. *Journal of Digital Information*, *10*(6).
Kirkegaard, B., & Borlund, P. (2008). Characteristics of information needs for television broadcasts of scholars and students in media studies. In *Proceedings of the second international symposium on Information interaction in context* (pp. 116–122). New York: ACM Press. http://doi.org/10.1145/1414694.1414720
Klavans, J. L., LaPlante, R., & Golbeck, J. (2013). Subject matter categorization of tags applied to digital images from art museums. *Journal of the American Society for Information Science and Technology*, n/a–n/a. http://doi.org/10.1002/asi.22950
Knautz, K., & Stock, W. G. (2011). Collective indexing of emotions in videos. *Journal of Documentation*, *67*(6), 975–994. http://doi.org/10.1108/00220411111183555
Kolker, R. (Ed.). (2008). *The Oxford handbook of film and media studies*. New York: Oxford University Press.
Koolen, M., Kamps, J., & de Keijzer, V. (2009). Information retrieval in cultural heritage. *Interdisciplinary Science Reviews*, *34*(2-3), 268–284. http://doi.org/10.1179/174327909X441153
Koopman, H., Sportiche, D., & Stabler, E. (2013). *An introduction to syntactic analysis and theory*. Hoboken: Wiley-Blackwell.
Körner, C., Kern, R., Grahsl, H.-P., & Strohmaier, M. (2010). Of categorizers and describers: an evaluation of quantitative measures for tagging motivation. In *Proceedings of the 21st ACM Conference on Hypertext and Hypermedia* (pp. 157–166). New York, NY, USA: ACM. http://doi.org/10.1145/1810617.1810645
Kovács, A. B., Markovich, R., Verbruggen, E., & Schuurman, J. (2013). *D5.1 Research methodology to define strategic agenda for online access to audiovisual content* (Public deliverable No. ICT PSP 325100). Retrieved from http://blog.euscreen.eu/reports
Krathwohl, D. R. (2002). A Revision of Bloom's taxonomy: an Overview. *Theory into Practice*, *41*(4), 212–218.
Kritzman, L. D., Reilly, B. J., & DeBevoise, M. B. (2007). *The columbia history of twentieth-century french thought*. Columbia University Press.
Kuhlthau, C. C. (1991). Inside the search process: Information seeking from the user's perspective. *Journal of the American Society for Information Science*, *42*(5).
Kuhn, A., & Westwell, G. (2014a). Area studies and film. *A dictionary of film studies*. Oxford: Oxford University Press.
Kuhn, A., & Westwell, G. (2014b). Cultural studies and film. *A dictionary of film studies*. Oxford: Oxford University Press.
Kuhn, A., & Westwell, G. (2014c). Film studies (cinema studies, cinematology, screen studies). *A dictionary of film studies*. Oxford: Oxford University Press.
Kuhn, A., & Westwell, G. (2014d). Media studies and film. *A dictionary of film studies*. Oxford: Oxford University Press.
Kuhn, A., & Westwell, G. (2014e). New film history. *A dictionary of film studies*. New York: Oxford University Press.
Kuhn, A., & Westwell, G. (2014f). Sociology and film. *A dictionary of film studies*. Oxford University Press.
Kunert, T. (2009). *User-centered interaction design patterns for interactive digital television applications*. London: Springer London. Retrieved from http://aleph.library.uu.nl/F/RXB1F2K3TFHX14YPC3QYXHB9IMFS7PT38612X14CAJNE9QL3GI-26180?func=find-e&request=User-Centered+Interaction+Design+Patterns+for+Interactive+Digital+Television+Applications&adjacent=N&find_scan_code=FIND_WRD&x=0&y=0
Kwok, K. L., & Kuan, W. (1988). Experiments with document components for indexing and retrieval. *Information Processing & Management*, *24*(4), 405–417. http://doi.org/10.1016/0306-4573(88)90044-1

Lai, K., & Chan, K. (2010). Do you know your music users' needs? A library user survey that helps enhance a user-centered music collection. *Journal of Academic Librarianship*, *36*(1), 63–69.
Lanagan, J., & Smeaton, A. F. (2012). Video digital libraries: contributive and decentralised. *International Journal on Digital Libraries*, *12*(4), 159–178. http://doi.org/http://dx.doi.org/10.1007/s00799-012-0078-z
Lancaster, F. W. (2003). *Indexing & abstracting in theory & practice* (3rd ed.). Champaign, Ill.: University of Illinois: Graduate School of Library and Information Science.
Laplante, A., & Downie, J. S. (2011). The utilitarian and hedonic outcomes of music information-seeking in everyday life. *Library and Information Science Research*, *33*(3), 202–210. http://doi.org/10.1016/j.lisr.2010.11.002
Larkin, C. R. (2007). A study of information-seeking behaviors and processes in subsets of visual arts humanities scholars: Toward a new model in image and text retrieval. *Canadian Journal of Information and Library Science-Revue Canadienne Des Sciences de L'Information et de Bibliotheconomie*, *30*(1-2), 99–99.
Larkin, C. R. (2010a). *A study of information-seeking behaviors and processes in subsets of visual arts humanities scholars: toward a newmodel in image and text retrieval*. Long Island University.
Larkin, C. R. (2010b). Looking to the future while learning from the past: information seeking in the visual arts. *Art Documentation: Bulletin of the Art Libraries Society of North America*, *29*(1), 49–60.
Larsen, B. (2004). *References and citations in automatic indexing and retrieval systems - experiments with the boomerang effect*. Department of Information Studies, Royal School of Library and Information Science. Retrieved from http://vbn.aau.dk/en/publications/references-and-citations-in-automatic-indexing-and-retrieval-systems--experiments-with-the-boomerang-effect(485ddde0-d6f7-41c1-bebe-0d555bbc2e38).html
Larsen, B., Åström, F., & Schneider, J. W. (Eds.). (2010). *The Janus faced scholar: A festschrift in honour of Peter Ingwersen* (Vol. Special volume of the e-zine of the international society for scientometrics and informetrics). Copenhagen: Det Informationsvidenskabelige Akademi (Royal School of Library and Information Science). Retrieved from http://vbn.aau.dk/en/publications/the-janus-faced-scholar(f1a79583-8d83-44f4-9b38-a3c0ba4e9cb3).html
Larsen, B., & Ingwersen, P. (2005). Cognitive Overlaps along the Polyrepresentation Continuum. In A. Spink & C. Cole (Eds.), *New Directions in Cognitive Information Retrieval* (pp. 43–60). Springer Netherlands. Retrieved from http://link.springer.com.proxy.uba.uva.nl:2048/chapter/10.1007/1-4020-4014-8_3
Larsen, B., Ingwersen, P., & Kekäläinen, J. (2006). The polyrepresentation continuum in IR. In *Proceedings of the 1st international conference on Information interaction in context* (p. 88). New York, NY: ACM Press. http://doi.org/10.1145/1164820.1164840
Larsen, P. (2012). Mediated fictions. In K. B. Jensen (Ed.), *A Handbook of Media and Communication Research: Qualitative and Quantitative Methodologies* (2nd ed, pp. 131–152). London [etc.]: Routledge.
Law, E., & Ahn, L. von. (2011). Human computation. *Synthesis Lectures on Artificial Intelligence and Machine Learning*, *5*(3), 1–121. http://doi.org/10.2200/S00371ED1V01Y201107AIM013
Layne, S. S. (1986). Analyzing the subject of a picture: a theoretical approach. *Cataloging & Classification Quarterly*, *6*(3), 39–62. http://doi.org/10.1300/J104v06n03_04
Layne, S. S. (1994). Artists, art historians, and visual art information. *The Reference Librarian*, *22*(47), 23–36. http://doi.org/10.1300/J120v22n47_03
Lee, C. S., Goh, D. H.-L., Razikin, K., & Chua, A. Y. K. (2009). Tagging, sharing and the influence of personal experience. *Journal of Digital Information*, *10*(1). Retrieved from https://journals.tdl.org/jodi/index.php/jodi/article/view/275
Lefebvre, T. (1993). Le "paratexte" du film dans le cinéma des premiers temps: définitions et hypothèses. In M. Lagni, M. Marie, J. A. Gili, & V. Pinel (Eds.), *Les vingt premières années du cinéma français* (pp. 203–212). Paris: Association française de recherche sur l'histoire du cinéma (AFRHC); Presses de la Sorbonne nouvelle (PSN).
Leigh, A. (2006). Context! Context! Context! Describing moving images at the collection level. *The Moving Image*, *6*(1), 33–65. http://doi.org/10.1353/mov.2006.0014
Library of Congress. (2008). Library of Congress collections policy statements. Motion Picture,

Broadcasting and Recorded Sound Division. Retrieved from http://www.loc.gov/acq/devpol/motion.pdf
Library of Congress. (2010). “Of” and “About.” Retrieved July 16, 2013, from http://www.loc.gov/rr/print/tgm1/iib.html
Library of Congress AMIM Revision Committee. (2000). *Archival moving image materials: a cataloging manual* (2nd ed.). Washington, D.C: Library of Congress.
Library of Congress Prints and Photographs Division. (2013). Graphic materials: rules for describing original items and historical collections. Retrieved November 5, 2015, from http://www.loc.gov/rr/print/gm/graphmat.html
Li, G., Wang, M., Zheng, Y.-T., Li, H., Zha, Z.-J., & Chua, T.-S. (2011). Shottagger: tag location for internet videos. In *Proceedings of the 1st ACM International Conference on Multimedia Retrieval* (pp. 37:1–37:8). New York, NY, USA: ACM. http://doi.org/10.1145/1991996.1992033
Lilja, J. (2008). Alternative classification and indexing systems for fiction films (Elokuvien vaihtoehtoisten sisällönkuvailumahdollisuuksien tarkastelua). *Informaatiotutkimus*, *19*(2), 41–50.
Lin, C.-S., & Chen, Y.-F. (2012a). Examining social tagging behaviour and the construction of an online folksonomy from the perspectives of cultural capital and social capital. *Journal of Information Science*, *38*(6), 540–557. http://doi.org/http://dx.doi.org/10.1177/0165551512459826
Lin, C.-S., & Chen, Y.-F. (2012b). The influences of online cultural capital on social tagging behavior. *Journal of Library and Information Studies*, *10*(2), 21–37.
Lingel, J. (2013). When “organizing becomes an extension of your brain”: DJs, music libraries and information practices. Presented at the iConferene, Texas: IDEALS. http://doi.org/10.9776/13214
Liu, Z. (2005). Reading behavior in the digital environment: Changes in reading behavior over the past ten years. *Journal of Documentation*, *61*(6), 700–712. http://doi.org/10.1108/00220410510632040
Loewy, R. (2009, June). *The CEN standards for metadata about cinematographic works: overview and current status*. Retrieved from http://www.efgproject.eu/downloads/cen-cws-synop-2009-06.pdf
Lohmann, S., Díaz, P., & Aedo, I. (2011). MUTO: the modular unified tagging ontology (pp. 95–104). Presented at the 7th International Conference on Semantic Systems, New York, NY, USA: ACM. http://doi.org/10.1145/2063518.2063531
Lopes, M. M. (2002). El trabajo de los indizadores: factores que afectan al analisis de contenido. Indexers in action: factors affecting content analysis. *Scire*, *8*(1), 119–130.
López-De-Solís, I., & Martín-López, C. (2011). Nuevas estrategias de negocio y valorización de los archivos audiovisuales en internet. *El Profesional de la Información*, *20*(6), 659–666. http://doi.org/10.3145/epi.2011.nov.09
López Hernández, A. (2003). El análisis cronológico-secuencial del documento fílmico. *Documentación de las Ciencias de la Información*, (26), 261–294.
Luckow, R., & Turner, J. M. (2008). All singing, all talking, all digital: media windows and archiving practice in the motion picture studios. *Archivaria*, (65), 165–186.
Lu, C., Park, J., & Hu, X. (2010). User tags versus expert-assigned subject terms: A comparison of LibraryThing tags and Library of Congress Subject Headings. *Journal of Information Science*, *36*(6), 763–779. http://doi.org/10.1177/0165551510386173
Lund, H., Bogers, T., Larsen, B., & Lykke, M. (2013). CHAOS: User-driven development of a metadata scheme for radio broadcast archives. Presented at the iConference, Texas. Retrieved from http://hdl.handle.net/2142/41279
Lykke, M., Hoj, A. L., Madsen, L. N., Golub, K., & Tudhope, D. (2012). Tagging behaviour with support from controlled vocabulary. In *Facets of Knowledge Organization* (pp. 41–50). London: Eeald Group Publishing Limited. Retrieved from http://iskouk.dyndns-web.com:8200/drupal/content/tagging-behaviour-support-controlled-vocabulary
Madden, A., Ruthven, I., & McMenemy, D. (2013). A classification scheme for content analyses of YouTube video comments. *Journal of Documentation*, *69*(5), 693–714. http://doi.org/10.1108/JD-06-2012-0078
Madrigal, A. C. (2014, January). How Netflix reverse engineered hollywood. *The Atlantic*. Retrieved from http://www.theatlantic.com/technology/archive/2014/01/how-netflix-reverse-engineered-hollywood/282679/3/
Maggio, L. A., Bresnahan, M., Flynn, D. B., Harzbecker, J., Blanchard, M., & Ginn, D. (2009). A case

study: using social tagging to engage students in learning Medical Subject Headings. *Journal of the Medical Library Association : JMLA*, *97*(2), 77–83. http://doi.org/10.3163/1536-5050.97.2.003
Mai, J.-E. (1999). Deconstructing the Indexing Process. In *Advances in Librarianship* (Vol. 23, pp. 269–298). Emerald Group Publishing Limited. Retrieved from http://www.emeraldinsight.com/doi/abs/10.1108/S0065-2830%281999%290000023013
Mai, J.-E. (2000). *The subject indexing process: an investigation of problems in knowledge representation*. University of Texas at Austin. Retrieved from http://catalog.lib.utexas.edu/record=b5210188
Mai, J.-E. (2001). Semiotics and indexing: an analysis of the subject indexing process. *Journal of Documentation*, *57*(5), 591–622. http://doi.org/http://dx.doi.org/10.1108/EUM0000000007095
Mai, J.-E. (2005). Analysis in indexing: document and domain centered approaches. *Information Processing & Management*, *41*(3), 599–611. http://doi.org/10.1016/j.ipm.2003.12.004
Manovich, L. (2012). How to compare one million images? In D. M. Berry (Ed.), *Understanding Digital Humanities* (pp. 249–278). Houndmills, Basingstoke, Hampshire ; New York: Palgrave Macmillan.
Marchionini, G. (2006). Exploratory search: from finding to understanding. *Communications of the ACM*, *49*(4), 41–46. http://doi.org/10.1145/1121949.1121979
Marchionini, G., Shah, C., Lee, C. A., & Capra, R. (2009). Query parameters for harvesting digital video and associated contextual information. In *Proceedings of the 9th ACM/IEEE-CS Joint Conference on Digital Libraries* (pp. 77–86). New York, NY, USA: ACM. http://doi.org/10.1145/1555400.1555414
Marchionini, G., Song, Y., & Farrell, R. (2009). Multimedia surrogates for video gisting: Toward combining spoken words and imagery. *Information Processing & Management*, *45*(6), 615–630. http://doi.org/10.1016/j.ipm.2009.05.007
Marchionini, G., Tibbo, H. R., Lee, C. A., Jones, P., Capra, R., Geisler, G., … Hill, B. (2009). *Vidarch: preserving video objects and context final report* (No. TR-2009-01). School of Information and Library Science, University of North Carolina, Chapel Hill. Retrieved from http://sils.unc.edu/sites/default/files/general/research/TR-2009-01.pdf
Marchionini, G., & White, R. (2007). Find what you need, understand what you find. *International Journal of Human-Computer Interaction*, *23*(3), 205–237. http://doi.org/10.1080/10447310701702352
Margree, P., Macfarlane, A., Price, L., & Robinson, L. (2014). Information behaviour of music record collectors. *Information Research*, *19*(4). Retrieved from http://www.informationr.net/ir/19-4/paper652.html#.VUtP6C7qXxU
Marlow, C., Naaman, M., Boyd, D., & Davis, M. (2006). HT06, tagging paper, taxonomy, Flickr, academic article, to read (pp. 31–40). Presented at the HYPERTEXT '06, New York, NY, USA: ACM. http://doi.org/10.1145/1149941.1149949
Marshall, C. C. (1997). Annotation: from paper books to the digital library. In *Proceedings of the Second ACM International Conference on Digital Libraries* (pp. 131–140). New York, NY, USA: ACM. http://doi.org/10.1145/263690.263806
Marshall, C. C. (1998). Toward an ecology of hypertext annotation. In *Proceedings of the Ninth ACM Conference on Hypertext and Hypermedia : Links, Objects, Time and Space; structure in Hypermedia Systems* (pp. 40–49). New York, NY, USA: ACM. http://doi.org/10.1145/276627.276632
Marshall, C. C. (2000). The future of annotation in a digital (paper) world. In *Successes and Failures of Digital Libraries* (pp. 97–117). University of Illinois at Urbana–Champaign.
Marshall, C. C., & Brush, A. J. B. (2004). Exploring the relationship between personal and public annotations. In *Proceedings of the 4th ACM/IEEE-CS Joint Conference on Digital Libraries* (pp. 349–357). New York, NY, USA: ACM. http://doi.org/10.1145/996350.996432
Martin, A. L. (Ed.). (2001). *AMIA compendium of moving image cataloging practice*. Beverly Hills, California / Chicago: Association of Moving Image Archivists (AMIA); and Society of American Archivists (SAA).
Martínez, J. M. (Ed.). (2004). MPEG-7 Overview (version 10). International Organisation for Standardisation. Retrieved from http://mpeg.chiariglione.org/standards/mpeg-7
Marvasti, A. F. (2008). *Social structure in tagging practices: reality or myth?* Queen's University. Retrieved from http://qspace.library.queensu.ca/handle/1974/1604

Marvasti, A. F., & Skillicorn, D. B. (2008). Structures in collaborative tagging: an empirical analysis. In B. Mans & M. Reynolds (Eds.), (Vol. 102, pp. 109–116). Presented at the 33rd Australasian Computer Science Conference (ACSC 2010), Brisbane, Australia: CRPIT. Retrieved from http://crpit.com/abstracts/CRPITV102Marvasti.html

Mason, H., & Robinson, L. (2011). The information-related behaviour of emerging artists and designers: Inspiration and guidance for new practitioners. *Journal of Documentation*, *67*(1), 159–180. http://doi.org/10.1108/00220411111105498

Masson, E., & Olesen, C. (2015). *Reconstructing chromatic experience in early dutch film distribution through EYE's Jean Desmet collection*. Presented at the The Colour Fantastic: Chromatic Worlds of Silent Cinema, EYE Film Institute, Amsterdam.

Matthews, B., Jones, C., Puzon, B., Moon, J., Tudhope, D., Golub, K., & Nielsen, M. L. (2010). An evaluation of enhancing social tagging with a knowledge organization system. *Aslib Proceedings*, *62*(4/5), 447–465. http://doi.org/10.1108/00012531011074690

Matusiak, K. K. (2006). Towards user-centered indexing in digital image collections. *OCLC Systems & Services*, *22*(4), 283–298. http://doi.org/10.1108/10650750610706998

Matuszewski, B. (1898). Une nouvelle source de l'histoire (creation d'un dépot de cinematographie historique). Retrieved from https://archive.org/details/unenouvellesourc00matu

McCarthy, M. (1991). *Discourse analysis for language teachers*. Cambridge; New York: Cambridge University Press.

McCracken, E. (2013). Expanding Genette's epitext/peritext model for transitional electronic literature: centrifugal and centripetal vectors on kindles and ipads. *Narrative*, *21*(1), 105–124. http://doi.org/10.1353/nar.2013.0005

Medin, D. L., & Aguilar, C. (2002). Categorización. In R. A. Wilson (Ed.), *Enciclopedia MIT de ciencias cognitivas* (pp. 295–297). Madrid: Síntesis.

Melenhorst, M., Grootveld, M., van Setten, M., & Veenstra, M. (2008). Tag-based information retrieval of video content (pp. 31–40). Presented at the UXTV '08, New York, NY, USA: ACM. http://doi.org/10.1145/1453805.1453813

Missikoff, M., Smith, F., & Taglino, F. (2015). Ontology building and maintenance in collaborative virtual environments. *Concurrency Computation*, *27*(11), 2796–2817. http://doi.org/10.1002/cpe.3440

Montgomery, P. (1997). The stock footage industry today. In *Footage: The Worldwide Moving Image Sourcebook* (pp. A31–A33). New York: Second Line Search.

Moretti, F. (2000). Conjectures on World Literature. *New Left Review*, (1), 54–68.

Morville, P. (2005). *Ambient findability: what we find changes who we become*. Beijing ; Sebastopol, CA: O'Reilly Media.

Moura, M. (2009). Folksonomias, redes sociais e a formação para o tagging literacy: desafios para a organização da informação em ambientes colaborativos virtuais / Folcsonomías, redes sociales y la formación para el tagging literacy. *Informação & Informação*, *14*. Retrieved from http://www.uel.br/revistas//uel/index.php/informacao/rt/captureCite/2196/0/BibtexCitationPlugin

Mühl, C. (2012). Inducing affect by music videos. In *Toward Affective Brain-Computer Interfaces: Exploring the Neurophysiology of Affect during Human Media Interaction* (pp. 55–86). The Netherlands.

Must, U. (2012). Alone or together: examples from history research. *Scientometrics*, *91*(2), 527–537.

Mu, X. (2010). Towards effective video annotation: An approach to automatically link notes with video content. *Computers and Education*, *55*(4), 1752–1763. http://doi.org/10.1016/j.compedu.2010.07.021

National archives. (n.d.). Research our records. Retrieved November 5, 2015, from http://www.archives.gov/research/catalog/lcdrg/elements/shot.html

Naumer, C. M., & Fisher, K. E. (2009). Information needs. In *Encyclopedia of Library and Information Sciences* (3rd ed., pp. 2452–2458). New York: Taylor & Francis.

Neal, D. R. (2012). *Indexing and retrieval of non-text information*. Berlin; Boston: De Gruyter Mouton.

NISO Press. (2004). Understanding metadata. National Information Standards Organization. Retrieved from http://www.niso.org/publications/press/UnderstandingMetadata.pdf

NISO Press. (2015). ANSI/NISO Z39.14-1997 (R2015) Guidelines for Abstracts - National Information Standards Organization. Retrieved from http://www.niso.org/apps/group_public/project/details.php?project_id=124

Noordegraaf, J., Bartholomew, A., Eveleigh, A., Proctor, N., & Cherry, R. (2014). Modeling crowdsourcing for cultural heritage. Presented at the MW2014: Museums and the Web, Baltimore, MD, USA. Retrieved from http://mw2014.museumsandtheweb.com/paper/modeling-crowdsourcing-for-cultural-heritage/

Numminen, P., & Vakkari, P. (2009). Question types in public libraries' digital reference service in Finland: Comparing 1999 and 2006. *Journal of the American Society for Information Science and Technology*, *60*(6), 1249–1257. http://doi.org/10.1002/asi.21047

Oard, D., Kim, J., Aversa, E., & Manley, C. (2001). Modeling information content using observable behavior. In *Proceedings of the 64th Annual Meeting of the American Society for Information Science and Technology* (pp. 481–488).

Oliner, A., Ganapathi, A., & Xu, W. (2012). Advances and challenges in log analysis. *Communications of the ACM*, *55*(2), 55–61. http://doi.org/10.1145/2076450.2076466

Oomen, J., & Aroyo, L. (2011). Crowdsourcing in the cultural heritage domain: opportunities and challenges. In *Proceedings of the 5th International Conference on Communities and Technologies* (pp. 138–149). New York, NY, USA: ACM. http://doi.org/10.1145/2103354.2103373

Oomen, J., Belice Baltussen, L., Limonard, S., van Ees, A., Brinkerink, M., Aroyo, L., … Gligorov, R. (2010). Emerging practices in the cultural heritage domain: social tagging of audiovisual heritage. Presented at the Web Science, Raleigh, NC: US. Retrieved from http://journal.webscience.org/337/

Oomen, J., Gligorov, R., & Hildebrand, M. (2014). Waisda?: making videos findable through crowdsourced annotations. In M. Ridge (Ed.), *Crowdsourcing our Cultural Heritage* (pp. 161–184). Ashgate Publishing, Ltd.

Oomen, J., Verbruggen, E., Tzouvaras, V., & Hyyppa, K. (2013). Television heritage linked and visualized: The EUscreen virtual exhibitions and the Linked Open Data pilot (pp. 393–396). Presented at the Digital Heritage International Congress, IEEE. http://doi.org/10.1109/DigitalHeritage.2013.6744788

Paling, S. (2002). Thresholds of access: paratextualily and classification. *Journal of Education for Library and Information Science*, *43*(2), 134. http://doi.org/10.2307/40323974

Palmer, C. L., & Neumann, L. J. (2002). The information work of interdisciplinary humanities scholars: exploration and translation. *The Library Quarterly*, *72*(1), 85–117.

Palmer, C. L., Teffeau, L. C., & Pirmann, C. M. (2009). *Scholarly information practices in the online environment: themes from the literature and implications for library service development*. Dublin, Ohio: OCLC Research. Retrieved from http://www.oclc.org/research/news/2009/01-23.html

Pankake, M. (1991). Humanities research in the 90s: what scholars need; what librarians can do. *Library Hi Tech*, *9*(1), 9–15.

Panofsky, E. (1939). *Studies in iconology : Humanistic themes in the art of the Renaissance* (1st Icon ed., 4th print). New York, NY: Harper & Row.

Pejtersen, A. M. (1994). A framework for indexing and representation of information based on work domain analysis: A fiction classification example. In *Knowledge organization and quality management* (pp. 251–263). Frankfurt/Main: Indeks Verlag.

Perrault, A. H., Aversa, E. S., Wohlmuth, S. R., & Miller, C. (2012). *Information Resources in the Humanities and the Arts* (6th edition). Santa Barbara, California: Libraries Unlimited.

Peters, I. (2009). *Folksonomies. indexing and retrieval in web 2.0* (1st ed.). De Gruyter.

Phelps, T. A., & Wilensky, R. (1996). Toward active, extensible, networked documents: multivalent architecture and applications. In *Proceedings of the First ACM International Conference on Digital Libraries* (pp. 100–108). New York, NY, USA: ACM. http://doi.org/10.1145/226931.226951

Phuong, L. T. T. (2011). *Processes of tagging behaviors : case studies of CiteULike, LibraryThing, YouTube and Flickr* (Master thesis). Oslo University College, Oslo. Retrieved from https://oda.hio.no/jspui/handle/10642/994

Pickard, A. J. (2007). *Research methods in information*. London: Facet Publishing.

Pickard, A. J., & Childs, S. (2013). *Research methods in information*. Chicago: Neal-Schuman.

Pierce, D. (2013). *The survival of american silent feature films: 1912–1929*. Washington, D.C.: Council

on Library and Information Resources and The Library of Congress. Retrieved from http://www.clir.org/pubs/reports/pub158
Piolat, A., Olive, T., & Kellogg, R. T. (2005). Cognitive effort during note taking. *Applied Cognitive Psychology*, *19*(3), 291–312. http://doi.org/10.1002/acp.1086
Purver, M. (2011). Topic segmentation. In G. Tur & R. De Mori (Eds.), *Spoken Language Understanding: Systems for Extracting Semantic Information from Speech* (pp. 291–317). Chichester, UK: John Wiley & Sons, Ltd.
Quan-Haase, A., & Martin, K. (2011). Seeking knowledge: An exploratory study of the role of social networks in the adoption of Ebooks by historians. In *Proceedings of the ASIST Annual Meeting* (Vol. 48). http://doi.org/10.1002/meet.2011.14504801128
Quinn, A. J., & Bederson, B. B. (2011). Human computation: a survey and taxonomy of a growing field. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 1403–1412). New York, NY, USA: ACM. http://doi.org/10.1145/1978942.1979148
Raban, D. R., Ronen, I., & Guy, I. (2011). Acting or reacting? Preferential attachment in a people-tagging system. *Journal of the American Society for Information Science and Technology*, *62*(4), 738–747. http://doi.org/10.1002/asi.21490
Radford, M. L., & Connaway, L. S. (2013). Not dead yet! A longitudinal study of query type and ready reference accuracy in live chat and IM reference. *Library & Information Science Research*, *35*(1), 2–13. http://doi.org/10.1016/j.lisr.2012.08.001
Rafferty, P., & Hidderley, R. (2005). *Indexing multimedia and creative works : the problems of meaning and interpretation / Pauline Rafferty and Rob Hidderley*. Aldershot etc: Ashgate.
Raimond, Y., Lowis, C., Hodgson, R., & Tinley, D. (2014). Automated metadata enrichment of large speech radio archives. *SMPTE Motion Imaging Journal*, *123*(1), 35–41. http://doi.org/10.5594/j18370
Rasmussen, E. (1997). Indexing images. In M. Williams (Ed.), *Annual Review of Information Science and Technology* (Vol. 32, pp. 169–196). Medford, N.J.: Learned Information.
Reitz, J. M. (Ed.). (2013). ODLIS: Online Dictionary for Library and Information Science. ABC-CLIO, LLC. Retrieved from http://www.abc-clio.com/ODLIS/odlis_jk.aspx#keywords
Ricci, S. (2009). Film archiving: history. In *Encyclopedia of Library and Information Sciences* (3rd ed., pp. 1853–1857). New York: Taylor & Francis.
Ridge, M. (2014). *Crowdsourcing our cultural heritage*. Ashgate Publishing, Ltd.
Rodríguez, D., & Pérez, B. (2011). Especificaciones y estándares sobre metadatos audiovisuales. In M. [et al] C. Sebastián, T. Hernández, D. Rodríguez, & B. Pérez, *Documentación Audiovisual* (pp. 134–165). Madrid: Editorial Síntesis, S. A.
Rose, T. (2002). Technology's impact on the information-seeking behavior of art historians. *Art Documentation: Journal of the Art Libraries Society of North America*, *21*(2), 35–42.
Roulston, K. (2010). *Reflective interviewing: a guide to theory and practice*. SAGE.
Roulston, K. (2013). Analysing interviews. In U. Flick (Ed.), *The SAGE Handbook of Qualitative Data Analysis* (pp. 297–312). SAGE.
Rüger, S. M. (2010). *Multimedia information retrieval*. [San Rafael, Calif.]: Morgan & Claypool Publishers.
Ruhl, M. (2012). Do we need metadata? An on-line survey in German archives. In *Proceedings of the 2nd International Workshop on Semantic Digital Archives* (Vol. 912, pp. 30–36).
Rusu, D., Fortuna, B., Grobelnik, M., & Mladeniæ, D. (2009). Semantic graphs derived from triplets with application in document summarization. *Informatica (Ljubljana)*, *33*(3), 357–362.
Ruvane, M. B. (2006). Defining annotations: a visual (re)interpretation. *Proceedings of the American Society for Information Science and Technology*, *43*(1), 1–5. http://doi.org/10.1002/meet.14504301226
Sanderson, R., Ciccarese, P., & Van de Sompel, H. (2013a). Designing the W3C open annotation data model. In *Proceedings of the 5th Annual ACM Web Science Conference* (pp. 366–375). New York, NY, USA: ACM. http://doi.org/10.1145/2464464.2464474
Sanderson, R., Ciccarese, P., & Van de Sompel, H. (2013b, February 8). Open annotation core data model specification (community draft). Open Annotation Community Group. Retrieved from http://www.openannotation.org/spec/core/core.html#Tagging

Sandom, C., & Enser, P. G. B. (2001). VIRAMI: visual information retrieval for archival moving imagery. Presented at the International Cultural Heritage Informatics Meeting, Milano, Italy: Archives & Museum Informatics. Retrieved from http://www.archimuse.com/publishing/ichim01_vol1/sandom.pdf

Sandom, C., & Enser, P. G. B. (2002). *VIRAMI : visual information retrieval for archival moving imagery*. [Great Britain]: Resource: The Council for Museums, Archives and Libraries.

Saracevic, T. (1991). Individual differences in organizing, searching and retrieving information. In J.-M. Griffiths (Ed.), *Proceedings of the Fourth Annual Meeting of the American Society for Information Science* (Vol. 28). Washington, D.C.: Medford, Learned Information.

Saracevic, T. (1996). Relevance reconsidered. In *Information science: Integration in perspectives* (pp. 201–218). Copenhagen, Denmark.

Saracevic, T. (2009). Information science. In *Encyclopedia of Library and Information Sciences* (3rd ed., pp. 2570–2585). New York: Taylor & Francis.

Saracevic, T., Kantor, P., Chemis, A. Y., & Trivison, D. (1988). A study of information seeking and retrieving. i. background and methodology. *Journal of the American Society for Information Science*, *39*(3).

Savolainen, R. (2012). Conceptualizing information need in context. *Information Research*, *17*(4). Retrieved from http://www.informationr.net/ir/17-4/paper534.html#.VHn0PclZjzw

Schreibman, S., Gradmann, S., Hennicke, S., Blanke, T., Chambers, S., Dunning, A., … Warwick, C. (2013). Beyond infrastructure: modelling scholarly research and collaboration. Presented at the Digital Humanities 2013, University of Nebraska, Lincoln. Retrieved from https://hal.inria.fr/hal-00801439/document

Schroeter, R., Hunter, J., & Kosovic, D. (2003). Vannotea: A collaborative video indexing, annotation and discussion system for broadband networks (pp. 1–8). Presented at the Knowledge capture, ACM Press (Association for Computing Machinery). Retrieved from http://espace.library.uq.edu.au/view/UQ:7897

Schulz, K. (2011, June 24). The mechanic muse - what is distant reading? *The New York Times*. Retrieved from http://www.nytimes.com/2011/06/26/books/review/the-mechanic-muse-what-is-distant-reading.html

Schwartz, C. (1977). Indexing behavior-survey and state of the art. In B. Fry (Ed.), *Information management in the 1980s: proceedings of the 40th ASIS Annual Meeting* (Vol. 14). Chicago, Illinois: New York, American Society for Information Science.

Scifleet, P., Williams, S. P., & Cole, C. (2009). The human art of encoding: markup as documentary practice. In M.-A. Sicilia & M. D. Lytras (Eds.), *Metadata and Semantics* (pp. 55–68). Springer US. Retrieved from http://link.springer.com/chapter/10.1007/978-0-387-77745-0_6

Seigneuret, J.-C. (Ed.). (1988). *Dictionary of literary themes and motifs*. New York: Greenwood Press.

Sekhar, M., & Ekbote, E. R. (1992). Cognitive skills of conceptualisation process. In *Ranganathan Birth Centenary Series, 5; 1-14 Cognitive paradigms in knowledge organisation* (pp. 23–34). Madras, India: Sarada Ranganathan Endowment for Library Science.

Sen, S., Lam, S. K., Rashid, A. M., Cosley, D., Frankowski, D., Osterhouse, J., … Riedl, J. (2006). Tagging, communities, vocabulary, evolution. In *Proceedings of the 2006 20th Anniversary Conference on Computer Supported Cooperative Work* (pp. 181–190). New York, NY, USA: ACM. http://doi.org/10.1145/1180875.1180904

Shirky, C. (2008). *Here comes everybody: the power of organizing without organizations*. New York: Penguin Press.

Simonsen, T. M. (2014). The functionality of paratexts on YouTube. In N. Desrochers & D. Apollon (Eds.), *Examining Paratextual Theory and its Applications in Digital Culture*. United States: IGI Global.

Simpson-Young, B., & Yap, K. (1995). *Work process of film and television researchers* (No. Technical Report 95/11). Australia: CSIRO Division of Information Technology. Retrieved from https://publications.csiro.au/rpr/pub?list=ASE&pid=procite:929884e7-0385-45ed-a65e-df3a1b34fbb5&sb=RECENT&expert=false&n=4&rpp=25&page=1&tr=7&subQueries[0].field=Title&subQueries[0].textSubQuery=film&filterCriteria.toMonth=Dec&filterCriteria.itemsWithFullText=false&filterCriteria.toYear=2016&filterCriteria.toDate=2016-12-

31&filterCriteria.fromMonth=Jan&filterCriteria.selectedAccessLevels[0]=All&filterCriteria.fromDate=1919&filterCriteria.fromYear=1919&dc4.publicationType=Report&dr=all
Sinha, R. (2005). A cognitive analysis of tagging: or how the lower cognitive cost of tagging makes it popular. Retrieved from http://rashmisinha.com/2005/09/27/a-cognitive-analysis-of-tagging/
Siorpaes, K., & Simperl, E. (2009). Human intelligence in the process of semantic content creation. *World Wide Web*, *13*(1-2), 33–59. http://doi.org/10.1007/s11280-009-0078-0
Skov, M. (2009). *The reinvented museum: exploring information seeking behaviour in a digital museum context*. Royal School of Library and Information Science, Denmark. Retrieved from http://pure.iva.dk/en/publications/the-reinvented-museum(0d1b8b30-406f-11de-8213-000ea68e967b).html
Skov, M., & Ingwersen, P. (2008). Exploring information seeking behaviour in a digital museum context. In *Proceedings of the second international symposium on Information interaction in context* (pp. 110–115). New York, NY, USA: ACM. http://doi.org/10.1145/1414694.1414719
Skov, M., & Lykke, M. (2012). Unlocking radio broadcasts: user needs in sound retrieval (pp. 298–301). Presented at the IIIX '12, New York, NY, USA: ACM. http://doi.org/10.1145/2362724.2362779
Smeaton, A. F. (2007). Techniques used and open challenges to the analysis, indexing and retrieval of digital video. *Information Systems*, *32*(4), 545–559. http://doi.org/10.1016/j.is.2006.09.001
Smiraglia, R. P. (2014). *The elements of knowledge organization*. Switzerland: Springer.
Smiraglia, R. P., Riva, P., & Žumer, M. (2014). *The FRBR family of conceptual models: toward a linked bibliographic future*. Routledge.
Smith, C. S. (2003). *Modes of discourse: the local structure of texts*. Cambrige: Cambridge University Press.
Smith, G. (2007). *Tagging: people-powered metadata for the social web*. New Riders Press.
Smith, S. L., & Kells, K. J. (2005). *Inside indexing: the decision-making process*. Lausanne, Switzerland: Northwest Indexing Press.
SMPTE Registration Authority, LLC. (2012). SMPTE metadata dictionary RP210v13. Retrieved from http://www.smpte-ra.org/mdd/
Snickars, P., & Vonderau, P. (2009). *The Youtube reader*. Stockholm: National Library of Sweden.
Society For Cinema and Media Studies. (2015). About us. Retrieved April 30, 2015, from http://www.cmstudies.org/?page=about_us
Soergel, D. (1985). *Organizing information: principles of data base and retrieval systems*. Morgan Kaufmann.
Soergel, D. (1986). Organizing information for problem solving. *Bulletin of the American Society for Information Science and Technology*, *13*(2), 24–25.
Soergel, D. (2009). *Digital libraries and the Semantic Web: a conceptual framework and an agenda for research and practice*. Presented at the ICSD 2009, International Conference for Digital Libraries and Semantic Web, University of Trento, Italy.
Soler Monreal, C., & Gil-Leiva, I. (2011). Evaluation of controlled vocabularies by inter-indexer consistency. *Information Research*, *16*(4), 8–8.
Sowa, J. F. (1984). *Conceptual structures: information processing in mind and machine*. Reading, Mass.: Addison-Wesley.
Springer, M., Dulabahn, B., Michel, P., Natanson, B., Reser, D., Woodward, D., & Zinkham, H. (2008). *For the common good: the Library of Congress Flickr pilot project* (Report). D.C.: Government of the United States; Library of Congress. Retrieved from http://www.egov.vic.gov.au/focus-on-countries/north-and-south-america-and-the-caribbean/united-states/government-initiatives-united-states/culture-sport-and-recreation-united-states/libraries-united-states/for-the-common-good-the-library-of-congress-flickr-pilot-project-in-pdf-format-1333kb-.html
Stam, D. C. (1984). How art historians look for information. *Art Documentation: Journal of the Art Libraries Society of North America*, *3*(4), 117–119.
Stanchev, P. L. (2011). *Multimedia standards. history. state of art* (Vol. 7105 LNCS).
Stanitzek, G. (2005). Texts and paratexts in media. *Critical Inquiry*, *32*(1), 27–42. http://doi.org/10.1086/498002
Stevenson, A. (Ed.). (2010). *Oxford dictionary of English*. New York: Oxford University Press.
Stewart, M. G. (2014). *How giant websites design for you (and a billion others, too)*. Retrieved from

http://www.ted.com/talks/margaret_gould_stewart_how_giant_websites_design_for_you_and_a_billion_others_too
Stockinger, P. (2012). *Introduction to audiovisual archives*. John Wiley & Sons.
Stockinger, P. (2013). *Audiovisual archives: digital text and discourse analysis*. John Wiley & Sons.
Stock, W. G. (2010). Concepts and semantic relations in information science. *Journal of the American Society for Information Science and Technology*, *61*(10), 1951–1969. http://doi.org/10.1002/asi.21382
Stone, S. (1982). Humanities scholars: information needs and uses. *Journal of Documentation*, *38*(4), 292–313. http://doi.org/10.1108/eb026734
Strohmaier, M., Körner, C., & Kern, R. (2012). Understanding why users tag: A survey of tagging motivation literature and results from an empirical study. *Web Semantics: Science, Services and Agents on the World Wide Web*, *17*, 1–11. http://doi.org/10.1016/j.websem.2012.09.003
Svenonius, E. (2004). The epistemological foundations of knowledge representations. *Library Trends*, *52*(3), 571–587.
Swanson, E. B. (2009). Information systems. In *Encyclopedia of Library and Information Sciences* (3rd ed., pp. 2635–2642). New York: Taylor & Francis.
Szomszor, M., Alani, H., Cantador, I., O'Hara, K., & Shadbolt, N. (2008). Semantic modelling of user interests based on cross-folksonomy analysis (pp. 632–648). Presented at the ISWC '08, Berlin, Heidelberg: Springer-Verlag. http://doi.org/10.1007/978-3-540-88564-1_40
Taylor, A. G., & Joudrey, D. N. (2009). Cataloging. In *Encyclopedia of Library and Information Sciences* (3rd ed., pp. 798–807). New York: Taylor & Francis.
Taylor, R. S. (1968). Question-negotiation and information seeking in libraries. *College & Research Libraries*, *29*(3), 178–194. http://doi.org/10.5860/crl_29_03_178
Tellis, W. (1997). Introduction to case study. *The Qualitative Report*, *3*(2). Retrieved from http://www.nova.edu/ssss/QR/QR3-2/tellis1.html
Tesfa, B. (2012). *Nichesourcing: a case study for pluvial data digitization for the Sahel* (Master Thesis). Vrije Universiteit, Amsterdam.
The European Film Gateway. (2009). *Common interoperability schema for archival resources* (No. D2.2) (p. 38). European Film Gateway (EFG). Retrieved from http://pro.europeana.eu/files/Europeana_Professional/Projects/Project_list/EFG/Deliverables/EFG%20D2.2%20Common%20interoperability%20schema%20for%20archival%20resources.pdf
The FIAF RULES revision project: the state of the art. (2008). Paris. Retrieved from http://www.filmstandards.org/fiaf/wiki/lib/exe/fetch.php?media=fiaf_rulesngma.pdf
Thiel, U., Brocks, H., Frommholz, I., Dirsch-Weigand, A., Keiper, J., Stein, A., & Neuhold, E. J. (2004). COLLATE – A collaboratory supporting research on historic European films. *International Journal on Digital Libraries*, *4*(1), 8–12. http://doi.org/10.1007/s00799-003-0069-1
Thøgersen, R. (2013). Data quality in an output-agreement game: a comparison between game-generated tags and professional descriptors. In P. Antunes, M. A. Gerosa, A. Sylvester, J. Vassileva, & G.-J. de Vreede (Eds.), *Collaboration and Technology* (pp. 126–142). Springer Berlin Heidelberg.
Thom-Santelli, J., Cosley, D., & Gay, G. (2010). What do you know?: experts, novices and territoriality in collaborative systems. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 1685–1694). New York, NY, USA: ACM. http://doi.org/10.1145/1753326.1753578
Thornberg, R., & Charmaz, K. (2013). Grounded theory and theoretical coding. In U. Flick (Ed.), *The SAGE Handbook of Qualitative Data Analysis* (pp. 153–169). London: Sage Publications Ltd. Retrieved from http://reader.eblib.com.proxy.library.uu.nl/(S(w2g2lo5y32broxkopjsy5na4))/Reader.aspx?p=1707694&o=998&u=V03nf%2bnOOGM%2fM8zF%2fo60CQ%3d%3d&t=1425453332&h=E5EDBE10BD46EA82B84F3DC1AE2F1F6851593317&s=33387062&ut=3282&pg=322&r=img&c=-1&pat=n&cms=-1&sd=2#
Tibbo, H. R. (1993). *Abstracting, information retrieval, and the humanities: providing access to historical literature*. American Library Association.
Tibbo, H. R. (1994). Indexing for the humanities. *Journal of the American Society for Information Science*, *45*(8), 607–619. http://doi.org/10.1002/(SICI)1097-4571(199409)45:8<607::AID-ASI16>3.0.CO;2-X

Tillett, B. B. (2004). ¿Qué es FRBR? Un modelo conceptual del universo bibliográfico. The Library of Congress Cataloging Distribution Service. Retrieved from http://www.loc.gov/catdir/cpso/Que-es-FRBR.pdf

Tirilly, P., Mu, X., Huang, C., Xie, I., Jeong, W., & Zhang, J. (2012). On the consistency and features of image similarity (pp. 164–173). Presented at the IIIX '12, New York, NY, USA: ACM. http://doi.org/10.1145/2362724.2362754

Toffler, A. (1980). *The third wave*. New York: William Morrow.

Toms, E. G., Villa, R., & McCay-Peet, L. (2013). How is a search system used in work task completion? *Journal of Information Science*, *39*(1), 15–25. http://doi.org/10.1177/0165551512469929

Toplin, R. B., & Eudy, J. (2002). The historian encounters film: A historiography. *Magazine of History*, *16*(4), 7–12.

Toulmin, V., Russell, P., & Neal, T. (2003). The Mitchell and Kenyon collection: Rewriting film history. *The Moving Image*, *3*(2), x, 1–18. http://doi.org/10.1353/mov.2003.0035

Trant, J. (2009a). Studying social tagging and folksonomy: a review and framework. *Journal of Digital Information*, *10*(1). Retrieved from http://journals.tdl.org/jodi/index.php/jodi/article/view/269

Trant, J. (2009b). Tagging, folksonomy and art museums: early experiments and ongoing research. *Journal of Digital Information*, *10*(1). Retrieved from http://journals.tdl.org/jodi/article/viewArticle/270

Trant, J. (2009c). *Tagging, folksonomy and art museums: results of steve.museum's research*. Retrieved from http://www.museumsandtheweb.com/blog/jtrant/stevemuseum_research_report_available_tagging_fo.html

Traub, M. C., van Ossenbruggen, J., & Hardman, L. (2015). Impact analysis of OCR quality on research tasks in digital archives. In S. Kapidakis, C. Mazurek, & M. Werla (Eds.), *Research and Advanced Technology for Digital Libraries* (Vol. 9316, pp. 252–263). Cham: Springer International Publishing.

Traub, M., van Ossenbruggen, J., & Hardman, L. (2014). Measuring the effectiveness of gamesourcing expert oil painting annotations. In *36th European Conference on Information Retrieval*. Amsterdam.

Troncy, R., Huet, B., & Schenk, S. (2011). *Multimedia semantics: metadata, analysis and interaction*. John Wiley & Sons.

Tsai, L.-C., Hwang, S.-L., & Tang, K.-H. (2011). Analysis of keyword-based tagging behaviors of experts and novices. *Online Information Review*, *35*(2), 272–290. http://doi.org/http://dx.doi.org/10.1108/14684521111128041

Tseng, S.-S., Yeh, H.-C., & Yang, S. (2014). Promoting different reading comprehension levels through online annotations. *Computer Assisted Language Learning*, *28*(1), 41–57. http://doi.org/10.1080/09588221.2014.927366

Tsivian, Y. (2009). Cinemetrics, part of the humanities' cyberinfrastructure. In M. Ross, M. Grauer, & B. Freisleben (Eds.), *Digital Tools in Media Studies: Analysis and Research : an Overview*. Bielefeld: transcript Verlag.

Tuominen, K., Talja, S., & Savolainen, R. (2002). Discourse, cognition, and reality: Toward a social constructionist metatheory for library and information science. In *Emerging frameworks and methods* (pp. 271–283). Greenwood Village, Colo.: Libraries Unlimited.

Turner, J. M. (1994). *Determining the subject content of still and moving image documents for storage and retrieval : an experimental investigation* (Doctoral thesis). University of Toronto, Toronto.

Turner, J. M. (1995). Comparing user-assigned terms with indexer-assigned terms for storage and retrieval of moving images: research results. In *Proceedings of the 58th Annual Meeting of the American Society for Information Science* (pp. 9–12).

Turner, J. M. (1998). *Images en mouvement: Stockage, reperage, indexation*. Sainte-Foy: Presses de l'Universite du Quebec.

Turner, J. M. (2009). Moving image indexing. In *Encyclopedia of Library and Information Sciences* (3rd ed., pp. 3671–3681). New York: Taylor & Francis.

Turner, J. M. (2010). From abc to http: the effervescent evolution of indexing for audiovisual materials. *Cataloging & Classification Quarterly*, *48*(1), 83–93. http://doi.org/10.1080/01639370903341919

Turner, J. M., & Colinet, E. (2005). Using shooting scripts for indexing moving images. *The Moving*

Image, *5*(1), 27–44. http://doi.org/10.1353/mov.2005.0020
Turner, J. M., Hudon, M., & Devin, Y. (2002). Organizing moving image collections for the digital era. *Information Outlook*, *6*(8), 14–18,21–22,24–25.
Twyman, D. (1999). The essential elements of film reviews. Retrieved November 5, 2015, from http://www.twyman-whitney.com/film/
UNESCO. (2012). Documentary and audiovisual heritage. Retrieved from http://www.unesco.org/new/en/phnompenh/communication-and-information/documentary-and-audiovisual-heritage/
University of Bristol. (2012, April 11). £246,000 for research into colour in the 1920s. Retrieved May 2, 2015, from http://www.bris.ac.uk/news/2012/8389.html
Unsworth, J. (2000). Scholarly primitives: What methods do humanities researchers have in common, and how might our tools reflect this? Presented at the Symposium on "Humanities Computing: formal methods, experimental practice," London: King's Collegue. Retrieved from http://people.brandeis.edu/~unsworth/Kings.5-00/primitives.html
Usai, P. C., Francis, D., Horwath, A., & Loebenstein, M. (Eds.). (2008). *Film curatorship: museums, curatorship and the moving image*. Vienna : Pordenone, Italy: Austrian Film Museum.
User-generated content. (2015). In *Wikipedia, the free encyclopedia*. Retrieved from https://en.wikipedia.org/w/index.php?title=User-generated_content&oldid=688341449
Ustarroz, C. (2013). *Teoria del VJing: Realizacion y representacion audiovisual a tiempo real* (2 edition). CreateSpace Independent Publishing Platform.
Valdivia, A. N. (Ed.). (2003). *A companion to media studies*. Malden, MA: Blackwell Publishing Ltd.
van Hooland, S. (2006). Spectator becomes annotator : possibilities offered by user-generated metadata for image databases. In *Proceedings CILIP Cataloguing & Indexing Group Annual Conference*. Norwich (United Kingdom). Retrieved from http://eprints.rclis.org/8080/
van Hooland, S., Méndez Rodríguez, E. M., & Boydens, I. (2011). Between commodification and engagement: on the double-edged impact of user-generated metadata within the cultural heritage sector. *Library Trends*, *59*(4), 707–720.
van Leuken, R. H. (2009). *Content-based multimedia retrieval: indexing and diversification*. Retrieved from http://dspace.library.uu.nl/handle/1874/33625
Venegas, R. (2011). Evaluación de resúmenes en español con Análisis Semántico Latente: Una implementación posible. *Revista Signos*, *44*(75), 85–102. http://doi.org/10.4067/S0718-09342011000100006
Voida, A., Grinter, R. E., Ducheneaut, N., Edwards, W. K., & Newman, M. W. (2005). Listening in: practices surrounding iTunes music sharing. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 191–200). ACM Press. http://doi.org/10.1145/1054972.1054999
Voss, J. (2007). Tagging, folksonomy & co: renaissance of manual indexing? Presented at the 10th international Symposium for Information Science, Cologne, Germany. Retrieved from http://arxiv.org/abs/cs/0701072
Voss, J., Wolfenstein, G., & Young, K. (2015). From crowdsourcing to knowledge communities: Creating meaningful scholarship through digital collaboration. Presented at the MW2015: Museums and the Web, Chicago, Illinois. Retrieved from http://mw2015.museumsandtheweb.com/paper/from-crowdsourcing-to-knowledge-communities-creating-meaningful-scholarship-through-digital-collaboration/
W3C. (1995). Collaboration, knowledge representation and automatability. Retrieved October 27, 2015, from http://www.w3.org/Collaboration/Overview.html#annotation
W3C. (2001). Metadata at W3C. Retrieved June 9, 2015, from http://www.w3.org/Metadata/
Walker, G., & Atkinson, S. D. (1991). Information access in the humanities: perils and pitfalls. *Library Hi Tech*, *9*(1), 23–33.
Walkowski, N.-O., & Barker, E. T. E. (2014). Digital humanists are motivated annotators. Presented at the Digital Humanities 2014, Laussane, Switzerland. Retrieved from http://dharchive.org/paper/DH2014/Paper-296.xml
Waller, R. (2003). Functionality in digital annotation: imitating and supporting real-world annotation. *Ariadne*, (35). Retrieved from

http://www.ariadne.ac.uk/issue35/waller#Annotations_and_metadata
Wang, A., Hoang, C. D. V., & Kan, M.-Y. (2012). Perspectives on crowdsourcing annotations for natural language processing. *Language Resources and Evaluation*, *47*(1), 9–31. http://doi.org/10.1007/s10579-012-9176-1
Wang, F.-Y., Carley, K. M., Zeng, D., & Mao, W. (2007). Social computing: from social informatics to social intelligence. *IEEE Intelligent Systems*, *22*(2), 79–83. http://doi.org/10.1109/MIS.2007.41
Wang, M., Ni, B., Hua, X.-S., & Chua, T.-S. (2012). Assistive tagging: a survey of multimedia tagging with human-computer joint exploration. *ACM Computing Surveys*, *44*(4), 25:1–25:24. http://doi.org/10.1145/2333112.2333120
Wang, X., Erdelez, S., Allen, C., Anderson, B., Cao, H., & Shyu, C.-R. (2012). Role of domain knowledge in developing user-centered medical-image indexing. *Journal of the American Society for Information Science and Technology*, *63*(2), 225–241. http://doi.org/10.1002/asi.21686
Waters, D., Cullyer, H., & The Andrew W. Mellon Foundation. (2014, June 5). Annotating the scholarly web. Retrieved February 25, 2015, from http://mellon.org/news-publications/articles/annotating-scholarly-web/
Watson-Boone, R. (1994). The information needs and habits of humanities scholars. *RQ*, *34*(2), 203–215.
Weinberg, B. H. (2009). Indexing: history and theory. In *Encyclopedia of Library and Information Sciences* (3rd ed., pp. 2277–2290). New York: Taylor & Francis.
Weinberger, D. (2008). *Everything is miscellaneous: the power of the new digital disorder*. New York: Henry Holt.
Westman, S. (2009). Image users' needs and searching behaviour. In A. Göker & J. Davies (Eds.), *Information Retrieval: Searching in the 21st Century; Human Information Retrieval* (pp. 63–83). John Wiley & Sons, Ltd. Retrieved from http://doi/10.1002/9780470033647.ch4/summary
White, R. W., & Roth, R. A. (2009). *Exploratory search: beyond the query-response paradigm*. [San Rafael, Calif.]: Morgan and Claypool Publishers. Retrieved from http://www.morganclaypool.com/doi/abs/10.2200/S00174ED1V01Y200901ICR003
Whittaker, S. (2011). Personal information management: From information consumption to curation. *Annual Review of Information Science and Technology*, *45*(1), 1–62. http://doi.org/10.1002/aris.2011.1440450108
Wiberley, S. E. (1983). Subject access in the humanities and the precision of the humanist's vocabulary. *The Library Quarterly*, *53*(4).
Wiberley, S. E., & Jones, W. G. (1989). Patterns of information seeking in the humanities. *College & Research Libraries*, *50*(6), 638–645.
Wikipedia. (2015). Wikipedia:How to write a plot summary. In *Wikipedia, the free encyclopedia*. Retrieved from https://en.wikipedia.org/w/index.php?title=Wikipedia:How_to_write_a_plot_summary&oldid=687817854
Wildemuth, B. M., & Case, D. O. (2010). Early information behavior research. *Bulletin of the American Society for Information Science and Technology*, *36*(3), 35–38.
Wilkie, C. (1999). *Managing film and video collections*. Aslib and Information Management International.
Wilson, T. D. (1981). On user studies and information needs. *Journal of Documentation*, *37*(1), 3–15.
Wilson, T. D. (1994). Information needs and uses: fifty years of progress. Information seeking behaviour, Behavior, Information needs, Information use. In B. Vickery (Ed.), *Fifty Years of Information Progress: A Journal of Documentation Review* (pp. 15–51). London: Aslib.
Wilson, T. D. (1999). Models in information behavior research. *Journal of Documentation*, *55*(3), 249–70.
Wilson, T. D. (2000). Human information behavior. *Informing Science: The International Journal of an Emerging Transdiscipline*, *3*(2), 49–55.
Wilson, T. D. (2010). Fifty years of information behavior research. *Bulletin of the American Society for Information Science and Technology*, *36*(3), 27–34.
Wilson, T. D. (2011). Revisiting user studies and information needs. *Journal of Documentation*, *62*(6), 681–684.

Winget, M. (2007). Annotation functionality for digital libraries supporting collaborative performance: An example of musical scores (pp. 305–306). Presented at the Joint Conference on Digital Libraries (JCDL), Vancouver, BC, Canada: ACM/IEEE. http://doi.org/10.1145/1255175.1255234

Winget, M. (2008). Annotations on musical scores by performing musicians: collaborative models, interactive methods, and music digital library tool development. *Journal of the American Society for Information Science and Technology*, *59*(12), 1878–1897.

Winget, M. (2009). Describing art: an alternative approach to subject access and interpretation. *Journal of Documentation*, *65*(6), 958–976.

Winget, M. (2013). A meditation on social reading and its implications for preservation. *Preservation, Digital Technology & Culture*, *42*(1), 39–52.

Winoto, P., & Tang, T. Y. (2010). The role of user mood in movie recommendations. *Expert Systems with Applications*, *37*(8), 6086–6092. http://doi.org/10.1016/j.eswa.2010.02.117

Witten, I. H., Bainbridge, D., & Nichols, D. M. (2009). Multimedia metadata: MPEG-7. In *How to Build a Digital Library* (2nd ed.). Morgan Kaufmann.

Wollmer, M., Weninger, F., Knaup, T., Schuller, B., Sun, C., Sagae, K., & Morency, L.-P. (2013). YouTube movie reviews: sentiment analysis in an audio-visual context. *IEEE Intelligent Systems*, (3), 46–53. http://doi.org/10.1109/MIS.2013.34

Woodley, M. S. (2005). DCMI Glossary. Dublin Core Metadata Initiative. Retrieved from http://dublincore.org/documents/usageguide/glossary.shtml

Wu, C., & Zhou, B. (2009). Analysis of tag within online social networks. In *Proceedings of the ACM 2009 International Conference on Supporting Group Work* (pp. 21–30). New York, NY, USA: ACM. http://doi.org/10.1145/1531674.1531678

Wylot, M., Cudre-Mauroux, P., & Groth, P. (2015). Executing provenance-enabled queries over web data. In *Proceedings of the 24th International Conference on World Wide Web* (pp. 1275–1285). Republic and Canton of Geneva, Switzerland: International World Wide Web Conferences Steering Committee. Retrieved from http://dl.acm.org/citation.cfm?id=2736277.2741143

Xie, I. (2008). *Interactive information retrieval in digital environments*. Hershey: IGI Pub.

Yakel, E. (2005). Archival intelligence. In K. E. Fisher, S. Erdelez, & L. McKechnie (Eds.), *Theories of Information Behavior* (pp. 49–53). Information Today, Inc.

Yang, M., & Marchionini, G. (2004). Exploring users' video relevance criteria: A pilot study. *Proceedings of the American Society for Information Science and Technology*, *41*(1), 229–238. http://doi.org/10.1002/meet.1450410127

Yee, M. M. (2007). *Moving image cataloging: how to create and how to use a moving image catalog*. Westport, Conn: Libraries Unlimited.

Yeh, M.-C., & Wu, W.-P. (2014). Clustering faces in movies using an automatically constructed social network. *IEEE MultiMedia*, *21*(2), 22–31. http://doi.org/10.1109/MMUL.2014.24

Yi, K., & Mai Chan, L. (2009). Linking folksonomy to Library of Congress subject headings: an exploratory study. *Journal of Documentation*, *65*(6), 872–900. http://doi.org/10.1108/00220410910998906

Zach, L. (2009). Arts literatures and their users. In *Encyclopedia of Library and Information Sciences* (3rd ed., pp. 313–320). New York: Taylor & Francis.

Zellhöfer, D., & Schmitt, I. (2010). Approaching multimedia retrieval from a polyrepresentative perspective. In M. Detyniecki, P. Knees, A. Nürnberger, M. Schedl, & S. Stober (Eds.), *Adaptive Multimedia Retrieval. Context, Exploration, and Fusion* (pp. 46–60). Springer Berlin Heidelberg.

Zeng, M. L. (2008). Knowledge Organization Systems (KOS). *Knowledge Organization*, *35*(2-3), 160–182.

Zhang, H., Smith, L. C., Twidale, M., & Gao, F. H. (2011). Seeing the wood for the trees: enhancing metadata subject elements with weights. *Information Technology and Libraries*, *30*(2), 75–80. http://doi.org/10.6017/ital.v30i2.3007

Zhou, D., Lawless, S., & Wade, V. (2012). Improving search via personalized query expansion using social media. *Information Retrieval*, *15*(3-4), 218–242. http://doi.org/10.1007/s10791-012-9191-2

Zollers, A. (2007). Emerging motivations for tagging: expression, performance, and activism. In *Tagging and Metadata for Social Information Organization Workshop*. Banff, Canada. Retrieved from http://www2007.org/workshops/paper_55.pdf

REFERRED PROJECTS AND WEBSITES

This section includes project websites of other websites that were referred to in this thesis and in Appendix A. They were marked with the abbreviation for “referred website” (rw) in superscript along the text. Other websites that were mentioned by participants are included in Appendix M, and also more websites are included in Appendices N and O. In a few cases they overlap. All links were checked on November, 2015.

Project or Website's name	URL
Aardvark (formely "mechanical zoo")	https://www.crunchbase.com/organization/aardvark
Accurator	http://accurator.nl/
Annotation of Structured Data Project	http://ils.unc.edu/annotation/
Annotation Projects at Harvard	http://www.annotations.harvard.edu/icb/icb.do?keyword=k80243&pageid=icb.page472230
Ask500People	https://www.crunchbase.com/organization/ask500people
Askville: as questions, find answers	http://askville.amazon.com/Index.do
Avant-Scène Cinéma	http://www.revues-de-cinema.net/Hist_revue/FRA_01017_Avant%20scene%20cinema_FRA.php
AXES Project	http://www.axes-project.eu/?page_id=2142
BBC ontologies	http://www.bbc.co.uk/ontologies
BBC's "Find, Listen, and Label"	http://www.bbc.co.uk/radio4/science/findlistenlabel/
BBC's Mooso: Listen, Tag, and Win	http://www.bbc.co.uk/blogs/radiolabs/2009/12/mooso.shtml
BFI's Screen online	http://www.screenonline.org.uk/
BIBFRAME	http://www.loc.gov/bibframe/
Big Six (notetaking)	http://big6.com/pages/posts/notetaking---big6-stage-4---use-of-information-72.php
Celluloid Remix contest	http://celluloidremix.openbeelden.nl/
Cinemacontext: Film in The Netherlands from 1896; an encyclopedia of film culture	http://www.cinemacontext.nl/
Cinemetrics	http://www.cinemetrics.lv/
CiteULike: Everyones' library	http://www.citeulike.org/
Clipper: Enhancing Time Based Media for Research	http://blog.clippertube.com/

Common Thesaurus for Audiovisual Archives (Gemeenschappelijke Thesaurus Audiovisuele Archieven, GTAA)	http://www.opencultuurdata.nl/wiki/nederlands-instituut-voor-beeld-en-geluid-thesaurus-gtaa/
Connotea (no longer existing)	http://www.connotea.org/
Del.icio.us	https://delicious.com/
Delpher: Nederlandse kranten, boeken en tijdschriften	http://www.delpher.nl/
Digital Hitchcock (Prof. Stephen Mamber's project, 1990)	http://www.tft.ucla.edu/mediascape/blog/?p=1366
Early modern visual marginalia workshop (2015)	http://www.crassh.cam.ac.uk/events/26149
Emolab	http://www.commit-nl.nl/news/emolab-in-frans-hals-museum
ESP game	https://en.wikipedia.org/wiki/ESP_game
European Film Gateway (EFG)	http://www.europeanfilmgateway.eu/content/about-european-film-gateway
Europeana Cloud	http://pro.europeana.eu/europeana-cloud/europeana-cloud-project-documents
EuScreen project description	http://blog.euscreen.eu/euscreenxl-in-12-slides
FIAF subject headings	http://www.fiafnet.org/uk/publications/iifp_subjectHeadings.html
Flickr	https://www.flickr.com/
Furl	https://en.wikipedia.org/wiki/Furl
Galaxy Zoo	http://www.galaxyzoo.org/
GitHub repository "Waisda?" experiment data	https://github.com/biktorrr/waisda_efg
GitHub repository "Waisda?" software	https://github.com/beeldengeluid/waisda
IMDB plot keywords	http://www.IMDB.com/Sections/Keywords/
LibraryThing: Catalog your books online	https://www.librarything.com/
Lifeboat for Knowledge Organization	http://www.iva.dk/bh/lifeboat_ko/home.htm
Living Room Candidate	http://www.livingroomcandidate.org/
LSCOM ontology	http://www.ee.columbia.edu/ln/dvmm/lscom/
Markup Analysis Project (MAP)	https://groups.google.com/forum/#!topic/biblios/hjrzkuqXM7o
Media Ecology Project (MEP)	https://sites.dartmouth.edu/mediaecology/
Metadata Games	http://www.metadatagames.org/

Movie Browser	(Alan & Smeaton, 2009, as cited in Geisler et al., 2010).
Movie Clips	http://www.movieclips.com/
NVIVO 10	http://www.qsrinternational.com/product
Open Cultuur Data	http://www.opencultuurdata.nl/
PopVideo (no longer available)	http://www.gwap.com/gwap/gamesPreview/popvideo/
Pratiques de l'annotation video (Workshop at the French National Library)	http://cinecast.fr/?cat=12
Project "Emotions in Film" at the University of Amsterdam	http://cdh.uva.nl/projects-2012-2013/emotions-in-film/emoties-in-film.html
Rebecca Project" (Lauren Rabinowitz and Greg Easley project, 1995)	http://www.amazon.co.uk/The-Rebecca-Project-Lauren-Rabinovitz/dp/0813521513
ReCaPTCHA project.	https://en.wikipedia.org/wiki/ReCAPTCHA
Red een Portret (Save a Portrait)	http://redeenportret.nl/
Scene Machine	http://www.scenemachine.nl
SPSS (IBM)	http://www-01.ibm.com/software/
Stardust@home project: A citizen sciene project	http://stardustathome.ssl.berkeley.edu/
Swedish film institute "Watch and discuss film"	http://www.filminstitutet.se/en/watch-and-discuss-film/
Synote	http://www.synote.org/synote/
"Systematic Review of Assigned Search Tasks"	http://ils.unc.edu/searchtasks/index.html
Text Encoding Initiative (TEI)	http://www.tei-c.org/index.xml
TREC	http://trec.nist.gov/overview.html
Vele Handen	https://velehanden.nl/
Vimeo	https://vimeo.com/
Video Data Bank	http://www.vdb.org/
Video Tag Game	http://www.videotag.co.uk/
Virtual Screening Room	http://ceci.mit.edu/projects/virtual_screening_room/index.htm
Waisda? System adapted for the test (no longer available)	http://prestoprime.cs.vu.nl/efg
Wornet	http://wordnetweb.princeton.edu/

Yahoo! Video Tag Game (no longer available, see R. van Zwol et al., 2008, as cited in Gligorov et al., 2011)	http://sandbox.yahoo.com/VideoTagGame/
Your Paintings Tagger	http://tagger.thepcf.org.uk
YouTube	https://www.youtube.com/
ZoneTag	https://www.flickr.com/groups/zonetagusers/
Zotero	https://www.zotero.org/

APPENDICES

Appendix A. Glossary[189]

"The easiest concepts to analyze are the ones that have already been codified for some technical project […]. The hardest concepts are the ones that are closest to veryday life."
(Sowa, 1984, p. 294)

This section includes a glossary of the main concepts adopted in this thesis with their corresponding definitions or attributions, or the scope or meaning attributed to them by the author of this work. The terms listed in this section appeared along the thesis with an asterisk mark (e.g., film*). The astherix mark is also used in the definitions to indicate that the concept with that mark is also defined here.

In addition, for definitions related to the IS&R framework, see The Turn, and Section 3.3.3. For definitions of common LIS or archival terms see for example Reitz (2013); the "Lifeboat for Knowledge Organization"[(rw)], or the "ALA Glossary of Library and Information Science" (Carter & Levine-Clark, 2013). For domain-specific terms, see for instance "A dictionary of film studies" (Kuhn and Westwell, 2014).

A-B

Actor

The term "actor", from a cognitive IIR perspective, indicates any person who engages in information searching or seeking activities, being in that sense the interpreter or provider of information or information objects (Ingwersen & Järvelin, 2005, p. 382)

This thesis uses the term "actor" in this sense, and also in the sense proposed by Fidel (2012): a "human participant in the interaction", where the interaction is part of a person's activities rather than an isolate process" (p.4).

See also: "User."

Annotation

This concept is central to this thesis. It is mostly discussed in §§3.4.1; 6.6.

Occasionally the term "description" is used as a synonym, as in the phrase "*the scholars' descriptions…"* In this case it refers to the annotations (or annotation outputs) that participants created during the studies.

The term also is used in this thesis to encompass the the general areas or tradition of identified in the literature review in Section 2.9 (i.e., indexing, tagging, and scholarly annotating (glossing)).

Annotation type

Annotation type or "type(s) of annotation(s)" refers either to a cognitive representation (different cognitive origins) or to a functional representation (the same cognitive origin). Each type is

[189] This definition has been simplified for the purpose of this glossary, based on the interpretation of the concepts of "material film artifact," "conceptual film artifal," and "archival moving image" proposed and discussed by Fossati (2009), who presents an analysis of the "archival life of film" based on these concepts.

characterized by a specific structural organization and presentation style (§6.6).

Archival moving image

An (archival) information object, more precisely a moving image* (also called a "moving image artifact" by some scholars). Archival means that it is selected to be preserved, or that it has the potential to be appraised and preserved by a memory institution* according to collection development policies. An archival moving image may differ from the same moving image that is viewed or distributed through different communication channels (e.g., an original digital film vs the reproduction shared in a YouTube channel). It means that it is an "information object" (analog or digital) that is part (or should be part) of the holdings of a given audiovisual archive*, or that has been curated* by a memory institution*. Audiovisual archives face several dilemmas caused by the digital transition about what moving images should become "archival" and how.

According to the definition of "film" proposed by some organizations responsible for their preservation, an archival moving image refers only to the "film"* or "moving image"* alone. In this thesis, the scope of the previous definition has changed as a result of the gained understanding from this investigation. Hence, "documentation"* or (film) "related materials*," and "metatexts*" are also considered part of the "archival moving image". This has consequences for the design of more comprehensive information systems and services offered by audiovisual archives*, even though the different documents (and user interactions) require different measures for their preservation.

See also: Moving image

Area studies

"Interdisciplinary scholarly studies of the languages, peoples, societies, and cultures of a definable geographical area (as for example Latin American studies, Oriental and African studies, Scandinavian studies, Slavonic and Eastern European studies, etc.)" (Kuhn & Westwell, 2014a).

Argumentative

One of the main four types of discoursive modes. "An argument passage brings something to the attention of the reader, makes a claim, comment, or argument and supports it in some way […]. The assertion of something new, surprising, or tendentious may function as a claim" (C. S. Smith, 2003, p. 33).

See also: Descriptive, Informational, Narrative.

Audiovisual

The term "audiovisual" (also "audio-visual") usually refers to documents that combine audio and visual signs. In this thesis, the term is used as quasi synonym with "moving image*," although both terms have different connotations in different communities: the term "audiovisual" seems to be more common within the television archival community, while "moving image" among the film archivists.

However, UNESCO (2012) indicates that audiovisual heritage comprises television, film and sound recordings. Hewett & Barber (2013) additionally indicate that "new media*" could be included within the term's scope; they state: audiovisual items fall into two categories: moving image and sound, which can be divided into five sub-groups: "film", "television", "radio", "other Audio (e.g. non-radio recordings)", and "new media (e.g. online, digital)".

Hence, when the term "audiovisual" is used in this thesis, it has a broad scope, the same as proposed by Usai, Francis, Horwath, and Loebenstein (2008): "audiovisual would include –but is not limited to- the formats of film, video, and audio tape, video and audio discs, computer files, and machine-readable or encoded data embodying sound and/or moving images; the distinctive technologies by which these images and sounds are reproduced and made accessible; the context in which they are created and disseminated; and their experience by an individual or collective audience" (p.233).

See also: Moving image

Audiovisual archives

One type of memory institution* which curates* "audiovisual*" information objects* and their related materials*.

The types of audiovisual archives are not clearly defined. King and Gracy (2009) suggest two types: "film archives" and "broadcast archives." Since "broadcast" denotes television and radio, there may be those other types of archives depending on this specialization level.

Sandom and Enser (2001) include "commercial footage companies", "national and regional public archives", "collections associated with museums", "corporate archives", "news and television libraries" as major types of "film archives."

In this thesis, it is assumed that audiovisual sources can be part of any type of memory institution* (or also educational or commercial institutions), but that some of the cultural heritage institutions have a more specialized focus on their curation. These include film archives and broadcast archives. In some cases, at the national level, both types can be part of a single autonomous audiovisual archive (e.g., a country's audiovisual archive), or of an audiovisual archive that belongs to a broader national body (e.g., a national library, or a national archive).

C

Casual user

Because the term "user" is widely used to refer to people outside an institution or to the "end-users" of an information processing system as opposed to their designers, and this thesis is about domain expert "user" contributions, the term "casual user" is used when there is a need to distinguish the "faceless crowd" from the experts. "Faceless crowd" does not mean here that those groups do not have skills or other relevant experiences, but that little details are known about their knowledge backgrounds, thus their indexing or domain expertise is undetermined.

These "casual users" are often called "non-information professionals" in this thesis, when there is a need to distinguish groups of people based on their level of indexing expertise.

See also: Actor, User, Contributor.

Cinema

It refers to "the industrial and institutional aspects of the medium" (Kuhn and Guy Westwell, film). "At its most fundamental, cinema is about the projection of movement in time and its simultaneous perception by the spectator" (Hayward, 2013, p.248).

See also: Film

Content and contents

There is a distinction in LIS between 'content' and 'contents'.

Content means "The essential matter or substance of a written work or discourse, as opposed to its form or style. In a more general sense, *all* the ideas, topics, facts, or statements contained in a book or other written work. Synonymous in this sense with *subject matter*. Also refers to the matter that is the subject of a course of study" (Reitz, 2013).

Contents means "All the divisions, chapters, articles, or individual works contained in a book, periodical, or other publication, usually listed in order of appearance with locators (page numbers) in the table of contents in the front matter of a book or on a page near the front of an issue of a periodical […and] the items physically contained in a box, binder, case, or holder designed to keep loose materials together" (Reitz, 2013). In a broader sense, it also means the listing of (structural)

components of a media collection or item.

Contributor

It means in this thesis a “user” who has the willingness to collaborate with any initiative for annotating archival moving images* or any other archival object proposed by a memory institution. Not to be confused with the term “contributor” proposed in the Dublin Core standard.

See also: “User,” “Actor”.

Crowdsoucing

See §§1.2; 2.5.

See also: Nichesourcing.

Cultural studies

“Cultural studies is an interdisciplinary field of study that emerged in the 1960s and 1970s from a range of subject areas, including literary theory, sociology, and anthropology, to examine relations of culture and power. Culture is broadly defined to include all cultural forms that can be said to shape values, beliefs, habit, taste, and behaviour; particular focus has been on those associated with the mass media, including print journalism, radio, film, and television. Cultural studies engages directly with how cultural values, meanings, and identities are established through cultural representations and institutions, especially in relation to social class, gender, ethnicity (and colonialism), and sexuality” (Kuhn & Westwell, 2014b), underlying is added.

Curation, curatorial

The meaning of this term in this thesis depends on the context. In some cases, it refers to the duty of the “museum” curator in selecting, preserving, and presenting certain works to the public. In other cases, it refers to the related meaning assigned to it in the LIS domain, which indicates the duty of the information professional in caring for collecting and describing those works, or any other archival object.

D-E

Descriptor

“In indexing, a preferred term, notation, or sequence of symbols assigned as an access point in the bibliographic record representing a document to indicate one of the subjects of its text (synonymous in library cataloging with the term subject heading)” (Reitz, 2003).

Descriptive

One of the main four types of discoursive modes. "Descriptive passages tend to focus on specifics: particular objects, people, mental states […]. Time is static or suspended. There are no significant changes or advancements. The entities introduced in descriptions are usually states, ongoing events, atelic events.” (Smith, 2003).

See also: Argumentative, Informational, Narrative, Description.

Description(s)

It is also used occasionally in the common sense of the word.

See: Annotation

Document

Essential concept to LIS which does not have a simple or unique "ontological" definition. For a history and critique of the term, see Day (2012). Susan Briet, one of the most important ones in the modern sense of the term explains: "If one refers to the "official" definitions of the French Union of Documentation Organizations […], one ascertains that the document is defined as: 'all bases of materially fixed knowledge, and capable of being used for consultation, study, and proof'" (Briet, 2006, as cited in Day, 2012, p.8).

See also: Information object, Source.

Digital turn

"As texts, or, less specifically, "contents," have become digital and increasingly born-digital or digital only, questions have arisen about the nature and implications of what may conveniently be termed a double transitional situation, that is, the transition of textual and audiovisual content to digital formats. This most recent permutation, which has been referred to as the digital turn, shift, age or era (not to mention revolution) follows three previous, and commonly acknowledged, intellectual and technological revolutions: the shift from oral literacy to writing, the invention of the printing press, and the adoption and distribution of pre-Internet mass media, dominated by television. It is both remarkable and challenging that the digital transition has taken little more than three decades, a very short interval in the long history of human culture. This implies that anyone endeavoring to explore and interpret how digital content is conceived, produced, accessed and reused in digital environments needs to take into account the lack of historical distance from the phenomena observed which may cloud their intellectual objectivity towards the object of study." (Desrochers and Apollon, 2014).

Documentation

In this thesis it does not refer to the "information science" discipline (See: *Document*) but to (audiovisual) documentation*, or related materials*.

Expertise

In this thesis it is considered as the cognitive background of an actor, knowledge of a domain or discipline (domain expertise), in this case associated to film and media; or about the techniques for indexing/cataloging (indexing expertise). As part of the first one, also professional expertise (e.g., making films, distributing or disseminating media) is included. And as part of the second one, also archival expertise (e.g., preservation) is ocassionally within the scope of the term. Some actors who do not have formal indexing expertise may have high levels of stewardship in describing or classifying (called "IR stewardship" in this thesis).

F

Fiction film

A type of movie*. Usually, movies are divided into fiction and non-fiction.

See: Moving image; Film.

Film

The term "film" adopted in this thesis is used to refer to "the medium in its entirety", which includes *all* "motion pictures" or "movies" (Kuhn and Guy Westwell, film).
The FIAF definition of film is the following: "by 'film' is meant a recording of moving images, with or without accompanying sounds, registered on motion picture film, video-tape, video-disc, or on any other medium now known or to be invented." The FIAF statutes include as one of its aims "to facilitate the collection and preservation of documentation of all kinds relating to the above" (International

Federation of Film Archives, 2015, p. Chapter I, Art.1).
Other views indicate that "a film is not only a sequence of moving images, but an organized mixture of images, words, texts, music, and noisse." (P. Larsen, 2012).
In some cases, the term "movie," or "audiovisual" is used instead of "film," when there is a possible ambiguity with the term "film" as celluloid.

See also: Archival moving image, Audiovisual, Cinema, Movie, Moving image, Multimedia

Film archive

See: Archival film, Audiovisual archive

Film-related material

"Related documents and apparatus" (International Federation of Film Archives, 2015).

The term "film-related materials" is used among the film archival community. The term "documentation" is more common among by audiovisual archives. Both terms indicate that the center is the moving image and a wide variety of other materials generated along the life of a media work* are related to it or "accompany" it. See also the discussion in Section 6.6 about the centrality of "the text" in relation to its paratexts.

See also: Documentation; Paratext; Related-material.

Film researcher

Or "researcher." Not to be confused with "film scholar*." Person who seeks audiovisual material for the purpose of documenting or adding footage to an audiovisual production. See also Section 7.4.4.1.

Film review

See: Review (film)

Film scholar

In this thesis it is defined as a humanities scholar who specializes on film and media. See also Appendix K, and Section 1.5.

Film scholarship

Equivalent in this thesis to film and media scholarship.

See Appendix K, and Section 1.5.

Film studies

Equivalent in this thesis to film and media studies. Film studies is a young academic discipline (Casey Benyahia & Mortimer, 2013). "From the 1970s, "film as art" has become an important argument also for scholars to promote the creation of film departments" (Fossati, 2009), and it is currently being incorporated into "media studies" (Ricci, 2009).

See Appendix K, and Section 1.5.

Findability

"(a). The quality of being locatable or navigable. (b). The degree to which a particular object is easy to discover or locate. (c). The degree to which a system or environment supports navigation and retrieval" (Morville, 2005).

G-H

Graphic materials

"Graphic materials include still images* of all types, such as prints, drawings, photographs, posters, postcards, pictorial advertisements, cartoons, comic strips, portraits, landscapes, book illustrations, born-digital pictures, etc. Special treatment usually results from the fragility, rarity, and enduring value of the materials, including potential aesthetic, iconographical, and documentary value. DCRM(G) may be used for graphic materials of any age or type of production, published or unpublished" (Library of Congress Prints and Photographs Division, 2013).

See also: Related material.

I

Information object

"Physical (digital) entities in a variety of media that belong to the information space of IR systems, providing potential information. Information objects are used interchangeably with the term documents" (Ingwersen & Järvelin, 2005, p. 19).

See also: Document, Source.

Information system

"The term is sometimes also used very generally and informally, without reference to either computers or organizations" (Swanson, 2009). In this thesis, when it refers to computers, the preferred term is "IR system*" or "information processing system". In the second meaning, the term "information system" has an organizational connotation (i.e., it may refer to any system which is not necessarily computer-based, for example, a library): "In an organization, an information system typically features people working interactively with computers to accomplish a particular task" (Swanson, 2009). In this sense, an audiovisual archive* is an information system.

See also: Information processing system, IR system, IIR system.

Information processing system

Any kind of computer-based system design for different additional purposes than to an IR syste (for example, QDA packages).

See also: Information system, IR system, IIR system.

Informational

One of the main four types of discoursive modes. "The Information mode gives information, presenting it as uncontroversial. Informative passages introduce mainly General Statives – generics and generalizing sentences – into the universe of discourse. This is the main difference between the Information and Description modes; the latter focuses on specifics, particulars of a single state of affairs." (Smith, 2003). Also called "instructive" (Fludernik, 2000).

See also: Argumentative, Descriptive, Narrative

IR stewardship

See definition in Section 3.5.1.

IR system

Information processing system focused on computer-based retrieval of information and documents.

In an IS&R framework, "an information system which is constituted by interactive processes between its information space, *IT setting*, *interface* functionalities and its environment, and capable of searching and finding *information* of potential value to seeker(s) of information" (Ingwersen and Järvelin, 2005, p.387).

In general terms IR system is used as in Swanson' (2009) definition: "commonly a computer-based system for providing information to an organization to help guide its actions. The term "information system" is also sometimes used in information science to refer to information retrieval systems based more on documents than on data, an application domain familiar to libraries, in particular".

See also: Information system; Information processing system; IIR system.

IIR system

Interactive Information Retrieval system. An IR system* that is designed following the underlying principles of interactive IR*.

Interactive IR

"The interactive communication processes that occur during retrieval of *information* by involving all major participants in IS&R, i.e., the *searcher*, the *socio-organizational context,* the *IT* setting, *interface* and *information space*." (INgwersen & Järvelin, 2005, p.386).

See also: IIR system; IR system; Information processing system; Information system.

Issness metadata

"Structured bibliographic or non-topical metadata often determined by selectors*. […] Such features could be journal or author names, publication date, music performer, video run time, or Web server address." (Ingwersen & Järvelin, 2005, p.292).

J-K-L

Keyword

"A significant word or phrase in the title, subject headings (descriptors), contents note, abstract, or text of a record in an online catalog or bibliographic database that can be used as a search term in a free-text search to retrieve all the records containing it" (Reitz, 2013).

"Amateurs call the process of assigning index terms keywording, although the term keyword usually means freetext term, not subject to vocabulary control" (Weinberg, 2009).

See also: Tag.

Keyphrase

"Grammatically speaking, two or more words that convey a single concept or thought or that constitute a part of a sentence that does not contain a subject or predicate. An *adjectival phrase* is a noun modified by one or more adjectives (*examples*: digital archives and small press). In a *prepositional phras*e, two words are joined by a preposition (*examples*: gone to press and out of print)" (Reitz, 2013).

In this thesis, keyphrases are often longer than 4 words (as opposed to tags* or keywords*).

Knowledge Organization System (KOS)

"Knowledge organization systems (KOS) is a general term referring to, among other things, the tools that present the organized interpretation of knowledge structures" (Hjørland, 2008).
"Data in a subject authority system are connected through semantic relationships, which may be expressed in subject authority records or generated according to specific needs (e.g., presenting the

broader and narrower concepts) in printed or online displays of thesauri, subject headings lists, classification schemes, and other subject authority systems. Such systems have been referred to as "controlled vocabularies", "structured vocabularies", "concept schemes", "encoding schemes", and "knowledge organization systems" interchangeably depending on their function and structure, as well as according to the communities that use them" (IFLA Working Group on the Functional Requirements for Subject Authority Records (FRSAR), 2010)

M

Media

All information objects in the information space in an IS&R system. There is a difference between analog media, which "operate through processes of numerical representation" (Beer & Gane, 2008, p. 6) and new media* also known as digital media.

See also: Multimedia.

Media work

The term "work" is defined in the FRBR model as "a distinct intellectual or artistic creation" (IFLA Study Group on the Functional Requirements for Bibliographic Records, 2009).

Assuming a broad concept of the term "film," media works include motion pictures*, movies*, television programs, and multimedia* documents.

Memory institution

An institution or organization that has the mission to preserve and curate* the historical memory of the human kind.

Institutions in this area are also known as "cultural heritage institutions", the LAM sector, the GLAM sector, or as "ALM institutions" (Huvila, 2014).

See also: Audiovisual archive.

Metadata

"Metadata is structured information that describes, explains, locates, or otherwise makes it easier to retrieve, use, or manage an information resource. Metadata is often called data about data or information about information. The term metadata is used differently in different communities. Some use it to refer to machine understandable information, while others use it only for records that describe electronic resources. In the library environment, metadata is commonly used for any formal scheme of resource description, applying to any type of object, digital or non-digital." (NISO Press, 2004).

In this thesis, the term is used with two meanings: (a) narrow: machine processable, used for digital information (Chapter 2), and (b): any form of structured or non-structured information that can be extracted from documents or their representations to facilitate resource or information retrieval or discovery (Chapters 3, 6, 8).

See also: Isness metadata.

Metatext

See Appendix L.

Motif

See Section 2.8.4.

Motion picture

Also called “film” or “movie”. Traditionally defined as “a series of still photographs on film, projected in rapid succession onto a screen by means of light” (“Encyclopedia Britannica,” 2015)

See also: Film, Moving image.

Movie

It is considered as a synonym with “film*” (Kuhn and Westwell, 2012), and “motion pictures*.”

Moving image

The term “moving image” can be used in a broad sense, to encompass a wide range of audiovisual works.

In a narrow sense, sometimes called “moving imagery,” it is used to encompass the terms “motion pictures,” “movies,” and “film.” These three terms share the characteristic of being “audiovisual,” but at the same time have slight differences with other audivisual documents, for instance, the communicative intention, or the settings where they are presented. Moving images, in this narrow sense, may be a way of “creative” expression; while for instance, television broadcast, have a more communicative (informational) intention (although not in the case of, for instance, television series).

These terms do not have precise definitions. This thesis uses the term mostly in the broad sense described above, although it may have an emphasis on the narrow sense, since the thesis topic within the specific context of television archives was not deeply investigated.

See also: Archival moving image; Audiovisual.

Multimedia

The term “multimedia” is partially used as a synonym of audio-visual*. In its original meaning, “multimedia” referred to those presentations that combined images synchronized to sound (Wise, 2000, as cited by Hartley, 2011). The history of the term has changed, and it is possible to ennunciate some slight differences with the term “audiovisual”. Hartley (2011) explains this evolution of the term “multimedia”:

“The literal definition of the term, as the processing and presentation of communication by more than one medium (audio and visual), still holds true, but has been extended and complicated in contemporary use. It is now most widely used to refer to communication that is mediated by computer technologies and that utilize a repertoire of graphics, text, sound, animation or video. This includes websites, video games, digital television, electronic books and CD-ROM. The boundaries of multimedia’s definition are far reaching and unspecified in literature on the subject. A common characteristic, however, is the appearance of cohesion or ‘seamlessness’. The integration of images, text, audio and video within multimedia is often made possible by digital technology, although it may also involve analogue media. Multimedia has liberated the way in which ideas are presented […]” (Hartley, 2011).

The term *multimedia* is problematic though, since it is common to many art forms to involve multiple media (Carroll, 1996).

Enser (2008v) even indicates that film and video are “innately multimedia documents,” hence, this explains why image retrieval—both still and moving—is increasingly seen as part of the more general problem of multimedia retrieval.” (Enser, 2008,v).

In this thesis, the term “audiovisual” is used instead of “multimedia,” to avoid confusion with the most contemporary use of the term, but, essentially, both terms are considered equal in that they encompass a comprehensive view of media as interrelated documents and forms of expression.

See also: Audiovisual

N-O

Narrative (discurse mode)

One of the main four types of discoursive modes. Discourse that "presents a sequence of events and states that have the same participants and/or a causal or other consequential relation (Labov& Waletzky 1966, Moens 1987). They occur in a certain order, which is crucial for understanding. […] The key to narrative advancement is the dynamism of events. Recall that dynamism involves successive stages in time." (Smith, 2003).

See also: *Argumentative, Descriptive, Informational*

New media

It is the same as media, which appears to be "new" to the contemporaries who are alive when the media appears and start to be used.

In current times, "what makes new media 'new' […] is that they operate through the production and processing of numerical (predominantly binary code): this might not seem much in itself; but the consequences of this development are far-reaching; not least because the representation of cultural forms (including ar, music, text) in numerical codes enables them to be reproduced, manipulated and transmitted with unprecedented ease" (Beer & Gane, 2008, p. 6). Sometimes used as a synonym for "digital media".

Nichesourcing

The original concept of *nichesourcing* (De Boer, Hildebrand, et al., 2012), is presented in Sections 1.2; 2.5.3; 2.6.

In this thesis it is adapted as follows: a form of *crowdsoucing* (and of human computation) applied to annotating-related tasks of information sources and objects (e.g., description, tagging, cataloging, indexing, or "annotating" in a broader sense) in the context of curatorial* work. *Nichesourcing* attemps to refine the advantages and overcoming the quality barriers inherent to the process of obtaining the annotations through non-experts (or people from whom the background knowledge is unknown). This is done in a controlled way, mediated by an information processing system, through the externalization of tasks (not necessarily micro-tasks) to specific groups of experts (niches) who contribute, usually in a voluntary way, or as a result derived from other tasks, with high-quality annotations. This happens as a consequence of their domain knowledge and the cognitive motivation inherent to the task.

Non-information professionals

See: Casual user

P

Paratext

Broadly, a related material* to a "text". In audiovisual archives often "the text" is the moving image* or media work*. This concept is discussed in Section 6.6.

Plot

"In literary theory, the pattern of events and situations in a narrative as they are selected and arranged to emphasize causal, spatial, or temporal links between the events [as opposed to story] (Kuhn & Westwell, 2014c).

"The scholar definition points to a specific organization of story elements, the order in which the

elements are presented" (Laura Copier, personal communication).

The term "plot" "is used to describe "everything visibly and audibly present in the film beore us." "The plot includes, first, all the story events that are directly depicted […]. Second, the film's plot may contain material that is extraneous to the story world, […] for example, the superposed credits and music" (i.e., the "nondiegetic elements") (Bordwell & Thomson, 2003, pp.70-72).

See also: Story.

Plot outline

In this thesis it has been defined as a type of metatext, often made of two to three lines (i.e., just a bit longer than a storyline*), where the main points of the plot are highlighted, leaving out any type of criticism or argumentative discourse, as well as background information about the media (e.g., if it is an adaptation). It does not include spoilers.

The definition provided by IMDB indicates that "outlines describe the story" (IMDB.com, Inc., 2015a). There is a distinction between story and plot though.

See also: Plot; Plot synopsis; Storyline; Synopsis; Review.

Plot summary

It is considered equivalent to Plot synopsis*.

Plot synopsis

In this thesis it has been defined as a type of metatext, often between three to ten lines long, where the plot* is summarized through a brief account of the main points. Plot synopses are very similar to "plot outlines," but a bit longer; and also similar to synopses*, but a bit shorter. However, they also differ with synopses in that they are mostly focused on the plot, leaving out argumentative discourse and background information. They do not often include spoilers:

·"Do not attempt to recreate the emotional impact of the work through the plot summary. Wikipedia is not a substitute for the original" (Wikipedia, 2015).

·[…]a condensed plot synopsis, with particular emphasis on big moments but with no revelation of the ending" (Bordwell, 1991)

See also: Plot; Plot outline; Plot summary; Storyline; Synopsis; Synopsis (critical); Review.

Primary source

"In scholarship, a document or record containing firsthand information or original data on a topic, used in preparing a derivative work. Primary sources include original manuscripts, periodical articles reporting original research or thought, diaries, memoirs, letters, journals, photographs, drawings, posters, film footage, sheet music, songs, interviews, government documents, public records, eyewitness accounts, newspaper clippings, etc." (Reitz, 2013).

Q-R

Related material

In this thesis it is considered as all "accompanying" materials to the moving images.

They can be graphic materials*, other media works*, annotations*, or documents where the performative life of a media is registered.

See also: Paratext, Documentation; Film-related material.

Review (film; movie; media)

One type of metatext created to comment a film or media work. These texts are usually created by domain experts, such as journalists, critics, or scholars; although there are also "user" (novices or fan) reviews. They can have different elements or structural components. Critic David Bordwell suggests four: a condensed plot synopsis, background information, a set of abbreviated arguments about the film, and an evaluation (§6.6.1). These elements are not always present (i.e., a plot synopsis or an evaluation), but what makes a review different from other metatexts, is the presence of background information and argumentative discourse. Reviews can have different presentation styles according to the emphasis or disposition of these elements, and their length and composition. They are published in different venues, as articles in specialized magazines or journals, or as part of other objects or compilations.

See also: Synopsis, Synopsis (critical).

S

Scheme

"The scheme in which the *nomen* is established, including value encoding schemes (subject heading lists, thesauri, classification systems, name authority lists, etc.) and syntax encoding schemes (standards for encoding dates, etc.)" (IFLA Working Group on the Functional Requirements for Subject Authority Records (FRSAR), 2010).

See also: Vocabulary encoding schemes.

Selectors (or information selectors)

"Selectors are, for instance, journal editors and reviewers, conference committee members, employers, database producers, etc. They possess quite a comprehensive control over the entire information system for which they make policy and strategic decisions […] Owing to their responsibilities information selectors become often turned into highly *authoritative* (search) keys to information objects, like editor and conference chair names on proceedings, employer (corporate) name, etc." (Ingwersen & Järvelin, 2005). Traditionally, information selectors have been responsible for producing *isness** metadata.

In this thesis "information selectors" are often referred as to "information professionals".

Shotlist

"A shot-by-shot description of a film or video" (National archives, n.d.).

Social utility

The term "social utility indicators" is used by Ingwersen (2011) to refer to "the metrics that apply Web 2.0 log information on users' searching, downloading, blogging, etc. behavior in order to measure various aspects of the *use* of Web sources" (p.34). In this thesis, it refers to the perception of the potential value for a given community of existing or potential users*.

Source

A broader term for "information object*". The term "source" encompases also "physical (digital) entities" that do not belong to the information space of an IR system (e.g., a video stored unorganizedly on a personal desktop, or a DVD in a personal library that does not have structured (IR) access mechanisms).

The term is also to refer to any media work* or collection that is the subject of study, reading or analysis by a scholar.

In the common LIS discourse, it means: “any document that provides information sought by a writer, researcher, library user, or person searching an online catalog or bibliographic database. Also refers to a document that provides information copied or reproduced in another document, for example, a quotation or excerpt. In literature, the story, legend, or work that inspires or provides elements of plot or characterization for another literary work, for example, the chronicles of English history on which William Shakespeare based some of his history plays” (Reitz, 2013).

See also: Document, Information object, Primary source

Still image

Still images have a longer history than moving images. Enser (2008b) defines an image as a “two-dimensional visual artifact.” Visual documents range from drawing to paintings and photographs. Enser (2008b) also presents a taxonomy of still images, which divides them into three categories: pictures (“a scenic or otherwise integrated assembly of visual features), hybrid pictures (a picture with integral text), and visual surrogates (a non-scenic, definitional visual artifact”, which includes: drawing, diagrams, maps, charts, plans, and devices, such as trademarks, logos or emblems).

Stock footage

“’Stock footage’ refers to any piece of film or video photographed by an outside source that is licensed to a producer or director for use in a separate, secondary production. This includes contemporary life-style material, news events, and historical images [this concept has evolved from an earlier definition as] “filmic material (usually motion picture outtakes of location beauty shots and without actors) that could be incorporated into another, separate production without anyone being aware of its deceptive borrowing” (DeCroix, 1997). There are two types of stock footage, which are hardly distinguishable nowadays: (1) footage that is used as a substitute for going out and shooting it yourself, and (2) footage that is used for its historical content (Montgomery, 1997).

Story

“The sequence of imagined events that the reader may reconstruct from their arrangement in the plot” (Kuhn & Westwell, 2014c).

“A story is a mental activity, what the viewer re-constructs on the basis on what the movie tells or doesn't tell” (Laura Copier, personal communication).

A story includes “all the events in a narrative, both the ones explicitly presented, and those the viewer infers” (Bordwell & Thomson, 2003, pp.70-72).

See also: Plot

Storyline

In this thesis it has been defined as a type of metatext that summarizes a plot in one line (maximun two sentences).

“The plot of a novel, play, film, or other narrative form.” (Stevenson, 2010).

The definitions above apply mostly to movies*, where there is an emphasis on the ofness (e.g., “this is the story of…”). When applied to other media, it often focuses on highligtng positive aspects in order to merchandize a product.

See also: Plot Outline; Plot Synopsis; Story; Synopsis; Review.

Subject access

Possibility to retrieve media works* or related materials* based on “aboutness” or “ofness” representations of their content*.

See also Section 2.2.1.

Synopsis

In this thesis it has been defined as a type of metatext, often more than ten lines long, where the plot is detailed. It often includes background information about the media work, but it does not include argumentative discourse (as opposed to critical synopsis* and reviews*). It may include spoilers.

The following are useful definitions:

·"An outline of the plot of a play, film, or book. Origin: early 17th century: via late Latin from Greek, from sun- 'together' + opsis 'seeing'." (Oxford Dictionary of English).

·A synopsis is a type of summarization (as also an "abstract" is). Synopses "should give indications on the plot or action ing to the setting (both geographically and chronologically) and also, eventually, to represented emotions" (Lancaster, 2003).

·"A condensed, orderly *abridgment* of a written work, such as the skeletalplot of a novel and the main points of a periodical article, often prepared by someone other than the author of the original. Sometimes used synonymously with abstract, compendium, and epitome (Carter & Levine-Clark, 2013, p. 249).

·This term originates from the practice of screenwriting (Laura Copier, personal communication).

It is not clear whether synopses should or not include spoilers, see for instance these definitions:

·It is a "detailed description of the entire plot of the title, including spoilers, so users who haven't seen a movie or missed an episode of a TV series can read everything about the title" (IMDB.com, Inc., 2015b).

·"Nothing is worse than revealing too much about the movie and thus ruining it for the viewer" (Twyman, 1999).

See also: Plot; Plot outline; Plot synopsis; Storyline; Synopsis (critical); Review.

Synopsis, critical

The same as synopsis*, but it introduces a few elements of analysis or interpretation into the plot summary; it describes the plot, but introduces the writer's perspective about question "what are the images trying to say, or what is the director trying to do in showing this?" However, it does not include strong arguments or criticism, as reviews* do.

See also: *Plot; Plot outline; Plot synopsis; Storyline; Synopsis; Review.*

T-U

Tag

There are different meanings for the term. In this thesis, it is used to refer to single words or short phrases (two to four words) that describe or represent different aspects of an information object (e.g., its content, its topic, its possible use, etc.). Tags are assigned by non-specified groups of people (usually called "users") in web environments (social sharing sites, GWAPs, etc.), but also in other information systems where formal terminology from LIS and IR disciplines (e.g., keyword, descriptor) is not used.

Tagging is also associated with "bookmarking," and considered together with this function as "a system, developed in 1996, that allows Internet users to store, classify, share, and search lists of bookmarked resources (Reitz, 2013).

In terms of function it is synonym with the term "keyword"*. In this sense, tags are "freely chosen keywords" (Marvasti, 2008). Usually people choose those keywords or tags, although the terms "tag" and "keyword" are also used to refer to automatically extracted or generated terms.

See also: Keyword

Theme

See Section 2.8.4.

Time-based

Annotations or representations of an audiovisual work at the shot or frame level *See also Section 2.2.2.*

User

Any person who uses the resources and services of a memory institution (sometimes called client or patron), or of a specific information (retrieval) system. (Adapted from Reitz, 2013).

See also: Actor; Casual user; Contributor

User-generated content (UGC)

“User-generated content (UGC) is defined as "any form of content such as blogs, wikis, discussion forums, posts, chats, tweets, podcasting, pins, digital images, video, audio files, advertisements and other forms of media that was created by users of an online system or service, often made available via social media websites".It entered mainstream usage during 2005,having arisen in web publishing and new media content production circles.” (“User-generated content,” 2015).

V-W-X-Y-Z

Visual information

Related to information existing in graphic materials*, still images*, and other pictorial works. It is one aspect of “audiovisual* information.”

Vocabulary Encoding schemes (VES)

Vocabulary Encoding Schemes indicate that the value [of a property] is a term from a controlled vocabulary, such as the value "China - History" from the Library of Congress Subject Headings” (Woodley, 2005).

Work

See: media work.

Appendix B. Data analysis code books

This appendix includes the resulting classification codes (or Nvivo "nodes"). These nodes were used across the different but interconnected studies (A, B, C). Section 4.7 indicates the methodological procedures in the context of which this code book was used.

In "*Classification No.7*" only the broad type is included, since the narrow type corresponds exactly to the table presented in Appendix H.

Quantitative details are summarized next:

- N= unique number
- n= number of "references" (i.e., coded fragments in Nvivo; for *Classification No.7*, broad behavioral aspects

Item	Type	Study A	Study B	Study C	n
Number of participants		N=36	N=10	N=14	
Number of soures	Tags	N=2,943			
	Annotation outputs		N=50		
	Audio transcripts		N=10	N=14	
	Questionnaires	N=36	N=10	N=14	
Number of references (behavioral aspects Classification No.7)	Annotating task-related				72
	Annotation type-related				48
	Attitude-related				55
	Attributes-related				114
	Behavior observed				21
	Cognitive factors				68
	Context related				49
	Document/Source related				43
	Seeking and search-related				344
	Use-related				95
	Research-related				89
	Teaching-related				22

No.	Name	Study	Broad	Narrow	Narrow 2	Scope note
Classification No.1	Instructional model	A; B; C	Cinematography			(as in instructions sent to participants). Also include: genre, tags that refer to parts of the movie: credits, intertitles (bot not their transcription)
			Emotion			(as in instructions sent to participants). Also include: genre, tags that refer to parts of the movie: credits, intertitles (bot not their transcription). If the tag is both a fact and an emotion, include it here (i.e. “tense music”).
			Explanation			(as in instructions sent to participants). Include also tags referring to associations made by the taggers to other sources (ex. “pippi”, “cocteau”)
			Fact			(as in instructions sent to participants).
			Other			(as in instructions sent to participants). Also the title, director or other credits of the movie (that are not shown on screen); Tags expressing when or where the movie was made
Classification No.2	Hollink's model	A	Non-visual			tags that describe the context of the video but not its content. Nonvisual level includes the following classes: creator, title, date, location, carrier type, etc.
			Perceptual			tags that refer solely to the content of the video. They are derived from low-level audio and visual features of the video
			Conceptual			semantic content of the image
Classification No.3	Panofsky's categories	A	Specific			Iconography. Mostly corresponds to proper nouns
			Abstract			Iconology. Mostly matches with abstract nouns: ideas, things you cannot touch or see
			General			Generics. Only require everyday knowledge. Mostly corresponds to common nouns: things you can see, touch. In the cases when it is a "genera" term using an abstract noun, prefer "abstract" (e.g., 'father', 'thief'), since this requires interpretation of the roles of the characters in the movie (as opposed to e.g., man, worker -as when you can see the uniform)

No.	Name	Study	Broad	Narrow	Narrow 2	Scope note
Classification No.4	Shatford's categories	A	Who			refers to the subject (person, object, etc) of the video fragment. (the most relevant, main “character” or object. Compare with Shatfort: in fixed images/pictures what it is “of”). Remember to add mark when it is used different than in Gligorov et al., (the use is different in relation to "what" category)
			What			refers to an object or event in the video.” (p.150). (all actions /verbs, and secondary objects). Remember to add mark when it is used different than in Gligorov et al., (mixed with "what" category)
			Where			refers to location
			When			refers to time
Classification No.5	Annotation type	B	Formal text			For annotations that look as descriptors, or follow a standard pattern
				Tag*/Keyword*		Usually less than 4 words
				Keyphrase*		Normally corresponds to keywords that are bigger than normal (more than 4 words), looks like an abridged sentence
				Shotlist*		
			Open text			For annotations that look as a wordier piece of writing than the formal annotations
				plot outline*		Two to three lines (3s.). Focus on plot. No critical arguments. No additional elements
				plot synopsis*		Between three to ten lines. Focus on plot. No critical arguments. No additional elements
				review (film)*		Different lenghts. Focus on plot optional (may include any or none of the previous types). Critical elements. Includes background information, arguments, and judgement
				storyline*		One line (2s.) Focus on plot. No critical arguments. No additional elements
				synopsis*		More than ten lines. Focus on plot (detailed). Critical elements are not emphasized and look as very "neutral", there is no intention to include argumentative discourse. Background information
				synopsis, critical*		More than ten lines. Focus on plot (sometimes detailed). Critical elements. Background information, arguments or judgement
			Combined			For annotations that include both types in the broad classification (i.e., Formal text and Open texts) in the same annotation output

No.	Name	Study	Broad	Narrow	Narrow 2	Scope note
Classification No.6	Discourse mode	B	Argumentative*			If it makes a claim or assertion of something new, it involves opinion, and the author assumes a posture
			Descriptive*			Focuses on specific objects, people, mental states. Use only when it is used alone, not as part of the narrative description. If they are separated, use both
			Instructive*			If it provides facts as uncontroversial, with an eductional or instructive purpose
			Narrative*			Presenting a sequence of events
Classification No.7	Attribute type		Cinematography	See Appendix H		Same as in Study A. If the attribute applies to the movie level, include here for instance: aesthetic movement or director's style
			Emotion			Same as in Study A. If the attribute applies to the movie level, include here for instance: general atmosphere of the movie
			Explanation			Same as in Study A. If the attribute applies to the movie level, include here for instance: genre, theme, or interpretative clues of the movie
			Fact			Same as in Study A. If the attribute applies to the movie level, include here for instance: descriptions of the main character, or elements of the plot
			Other			Same as in Study A. Also, include here for instance: details about the type of clip, the clip in relation to the movie, extratextual relations.
	Granularity		Movie			
			Clip			If the attribute applies only to the clip

No.	Name	Study	Broad	Narrow	Narrow 2	Scope note
Qualitative classification	Actor	A, B, C	Actor-data	Code or name		From questionnaire No.1
				Age group		From questionnaire No.1
				Profile main type	(scholar, curator, professional)	Assign according to current role
				Institution		From Questionnaire No.1, or according to current role
				Institution type		From questionnaire No.1
				Country		Not nationality, work place
				Expertise with films		From questionnaire No.1
				Research focus	(aesthetic, cultural, media-history, epistemological, data-driven, n.a.)	Assign the most predominant category from interview analysis, combined with analyzing a sample of their publications, or ask the participant
			Actor-questionnaire			
				Professional area		From questionnaire No.1
				Years of experience		From questionnaire No.1
				Experience with indexing, cataloging		From questionnaire No.1
				Familiarity with creating tags		From questionnaire No.1
				Familiarity with searching through tags		From questionnaire No.1
				Familiarity with (labeling) games		From questionnaire No.1

No.	Name	Study	Broad	Narrow	Narrow 2	Scope note
Qualitative classification	Task	A, B, C	Tagging task			Apply to all nodes from Study A
				Number of tags		Register only total after quantitative analysis
				Types of tags used		From Waisda game, Classification No.1
				Self-reported semantic categories		From questionnaire No.1, Waisda game
				Difficulty to come up with tags		From questionnaire No.1, Waisda game
				Capability of entering all tags		From questionnaire No.1, Waisda game (also to code participant's comment if applicable)
				Motivation by scoring		From questionnaire No.1, Waisda game
				Usefulness of instructions		From questionnaire No.1, Waisda game
			Annotating task			Apply to all nodes from Study B
				Types of annotations used		Register only total after quantitative analysis
				Discoursive modes used		Register only total after quantitative analysis
				Attributes used		Register only total after quantitative analysis
			Seeking task			Apply to all nodes from Study C
	Behavioral aspects		Annotating task-related			
				Procedural		Explicit mention or implicit suggestion from the participant on aspects related to "protocols" or procedures, for example: the need for guidance during annotation (instructions), extension, etc.
				Annotation as work		Comments about annotation (indexing) as a professional work, or a work specialized in itself. Also includes comments about automated annotations.

No.	Name	Study	Broad	Narrow	Narrow 2	Scope note
Qualitative classification	Behavioral aspects	A, B, C	Annotation type-related			
				Tags/keywords/tagging		Coments about "tags" or "keywords" as a way to annotate for future retrieval or personal use
				Synopses		Explicit mention of synopses of any kind as a way of annotating for retrieval or personal use. Add the type from Classification No.5 if applicable
				Shot by shor or sequence analysis		Comments or explanations about what these two annotation forms are, and how would they use them or not for description/retrieval purposes.
				Glossing, personal		When the participant talks about annotation (as in note-taking) and how they use them in practice for their own research or studies
				Other annotation types		When the participant talks about other annotation forms not listed, and how they use them in practice for their own research or studies. Use terms from Classification No.5 if applicable
			Attitude-related			
				Games-gwap		Comments or behaviors related to games; code q.22 from questionnaire No.1
				Motivation		For comments about motivation for tagging, annotating, searching…
				Strong opinion		Code strong opinions from the participants about an annotation related aspect: games, sharing annotations, *crowdsoucing*, etc. It goes in combination with the code that expresses the factor.
				Sharing information		comments about reasons why participant shares or not information online, or in general
				Shared information		comments about socially-generated annotations

No.	Name	Study	Broad	Narrow	Narrow 2	Scope note
Qualitative classification	Behavioral aspects	A, B, C	Attributes-related			
				Semantic categories		When the participant talks about aspects associated to semantic categories from Classification No.1, use the corresponding code from that classification added to this
				Ganularity		When the participant is concerned about the level of the source to which their annotations apply (clip, entire movie), or in relation to access/searching levels
				Content annotation		When the participant talks broadly about access to content, or what content means for her/him
			Behavior observed			Here I code all actions that I observed and wrote in notebook about the participant performed during annotation. The corresponding action is described as a comment to the transcript, separated with %.
				Replaying		notes about intention to replay or if the participant asked for it
				Pausing		(same as replaying)
				Searching while annotating		(same as replaying)
				Searching (general)		notes about actions performed during searching: opening Google first, or typing in the address bar a known URL
				Sharing intention		If the participant wants to share something while searching or annotating
			Cognitive factors			aspects refering to the thinking activities as expressed by the actor
				Influencing factors for an activity		When the participant suggests that the annotation may be influenced by factors in other categories than type of document or expertise (e.g., time constraints); when participant says what influences her searching activity
				Self-reported background knowledge (expertise)		code comments from the participants about their knowledge both of the domain and indexing/cataloguing expertise
				Self-reported expertise with indexing		

No.	Name	Study	Broad	Narrow	Narrow 2	Scope note
Qualitative classification	Behavioral aspects	A, B, C	Context related			
				Crowdsoucing		
				Political/social implications		
				Role of the archives		
			Document/Source related			
				Source familiarity		Referring to influence in the annotation task of previous knowledge about the source and other factors (e.g., quality of the source). Also use to code questionnaire data (questionnaire No.1, q21)
				Source type		Influence of the type of source (quality, formal aspects, content, etc.) on the annotation.
			Seeking and search-related			if it refers only or broadly to information search and seeking behavior (not to annotation)
				Access related		Use for coments about ways to come across sources or information; general access problems or barriers
				Digitization		Explicit references about projects the participant knows about; impact of digitization on search and research
				Attributes for searching		
				Searching behavior		
					information systems	
					general (observed behavior)	
					browsing	
					film archives	
					archives' interfaces	
					query characteristics	
					relevance judgement	

No.	Name	Study	Broad	Narrow	Narrow 2	Scope note
Qualitative classification	Behavioral aspects	A, B, C	Seeking and search-related (cont.)	Personal information management		
				Sources	colleagues	
					collectors	
					mailing lists	
					festivals/meetings	
					secondary	
					personal library	
					primary	
				Keeping up to date		
				Motivations for searching		From questionnaire No.2
			Use-related			broad perceptions from the participant about what could be the use of the annotations they create, or in general.
				Users/readers of an annotation		When the participant comments or reflects on who is the user of their annotations, or when they mention potential user groups
				Purpose of the annotation		
				Usefulness of tags		From questionnaire No.1
				Use of clips		
				Film viewing		

No.	Name	Study	Broad	Narrow	Narrow 2	Scope note
Qualitative classification	Behavioral aspects	A, B, C	Research-related			
				Topics specialization		Use for explicit reference about research questions or specific projects, topics that the participant is working or has worked with; include answers to Questionnaire No.2 (q.3)
				Areas research		
				Topic selection		comments about how a topic is selected, how a research originates from a topic
				Research activity		Comments about what does it mean to be a researcher, what kinds of activities does it include
				Other activities		
				Canon		ideas about the canon. If it is an strong opinion, add code
				Analysis metods		Use for references to methods used for the participant to analyze her/his own sources
			Teaching-related			when it is clearly specified, or observed, than an aspect is related to teaching, add this code to the aspect (e.g., use of clips + teaching)

Appendix C. Personal information questionnaire

These questions were applied to all participants in different moments of each study's data collection: Study A (Appendix E), Study B (Appendix I), and Study C (Appendix J).

PART 1. Personal / Professional information

(1). Please enter the name you used for the Waisda-EFG game (the name you used to log in to the game).

This is only for the purposes of the study, in order to be able to link the tags you entered with the answers in the questionnaire.

(2). What is your professional area or main area of studies?

Please choose **all** that apply:

- o Arts
- o Computer science
- o Engineering
- o History
- o Library and/or Information science
- o Journalism and/or media studies
- o Linguistics
- o Literature
- o Museology
- o Philosophy
- o Other _____

(3). In what kind of institution do you work or study?

Please choose **only one** of the following:

- o Academic library Academic library
- o Cultural institute Cultural institute
- o Film museum/institute/cinematheque Film museum/institute/cinematheque
- o Government department Government department
- o National library National library
- o Public library Public library
- o University (researcher/teacher/PhD) University (researcher/teacher/PhD)
- o University (bachelor/master student) University (bachelor/master student)
- o Other_____

(4). Which of the following categories best describes your expertise with films?

Please choose **only one** of the following:

- o Novice (I don't know much about films)
- o Film cataloguer or archivist Film cataloguer or archivist
- o Film critic Film critic
- o Film enthusiast (film lover and constant movie-goer) Film enthusiast (film lover and constant movie-goer)
- o Film historian Film historian
- o Film/media maker Film/media maker
- o Film programmer or disseminator Film programmer or disseminator
- o Film restorer Film restorer
- o Film/video technician (digital, analogue) Film/video technician (digital, analogue)
- o Other_____

(5). For how long have you been in professional contact with film content/materials?

Please choose **only one** of the following:

- o 0 to 3 years
- o 4 to 6 years
- o 7 to 9 years
- o 10 years or more

(6). Which is your age?

Please choose **only one** of the following:

- o 20 or younger
- o 21-29
- o 30-39
- o 40-49
- o 50-59
- o 60 or older

PART 2. Previous experience with indexing, tagging and labeling games

(7). Do you have professional experience with indexing/cataloging?

Please choose **only one** of the following:

- o Yes
- o No

(8). Are you familiar with creating tags (words or keywords) for online content (for example: labeling images in Flickr, or videos in Youtube, or bookmarks in Delicious)?

Please choose **only one** of the following:

1	2	3	4	5

Please choose between 1 and 5, where 1 is "not at all familiar" and 5 is "extremely familiar".

(9). Are you familiar with video search through keywords or tags?

Please choose **only one** of the following:

1	2	3	4	5

Please choose between 1 and 5, where 1 is "not at all familiar" and 5 is "extremely familiar".

(10). Are you familiar with tagging (labeling) games? *

Please choose **only one** of the following:

1	2	3	4	5

Please choose between 1 and 5, where 1 is "not at all familiar", that is, you don't know anything about them and haven't played any labeling game before, and 5 is "extremely familiar", that is, you know what are these games about and/or play.

(11). If you chose 2, 3, 4 or 5 in the previous question, please indicate which image or video labeling games have you played.

Please write your answer here:

Please include *"Waisda?"* if you have played it before.

Appendix D. Email to participants Study A

This email was sent to the participants who accepted to play the *"Waisda?"* game after invitation. The fifth part was omitted in the case of the groups with no instructions. See Section 5.4.5 for more details.

Dear participant,

Thank you very much for taking part of this game!

It is an experiment for Liliana Melgar's PhD research at Universidad Carlos III de Madrid and VU University Amsterdam. It will take about 30 minutes of your time. The procedure is as follows:

You are kindly asked to play the Waisda-EFG video labeling game. It consists on entering as many tags (words, keywords) as you can while watching each of the five videos we selected from the European Film Gateway. Each video is a film clip and lasts between 1:30 and 6 minutes (12 min. in total). There is also a questionnaire at the end of the game. Don't worry if you don't know anything about tagging or tagging games, reading the instructions below carefully before starting is enough.

(1). First open the Web page http://prestoprime.cs.vu.nl/efg

(2). Login with the credentials listed below. This means that other players won't identify you, but the research team at VU will be able to connect the tags to this email address:

- Email: p01@waisda.nl
- Password: waisda

(3). Get familiar with the interface.

(4). Start a game by selecting one of the videos. Take this into account:

- You will have 20 seconds to get ready before each video begins.
- The cursor will be placed in a small box below the video where you can start typing your tags.
- Start typing when the video begins.
- Press "enter" for each tag (word) you type.
- You can use your mother tongue (if it is English, Spanish or Dutch), otherwise, please use English.
- You score 5 points for each tag you enter and 50 points for tags that are also entered by other users.
- You can see immediate feedback (your scores) on the right side of the screen.
- Please, play the game with all 5 videos, only once per video. The videos cannot be paused or played again.
- Don't forget to activate the sound in your computer.

(5). Tags consisting of one or two words are more likely to match then longer phrases. Tags may be about the following aspects (please try to cover as many as you can during the game):

- **Facts**. What you see or hear in the scene, such as objects, persons, places and actions (e.g. woman, sofa, London, R2D2, murder).
- **Cinematography**. Stylistic features, such as form, style, framing, camera movement, lightning key, type of shot, camera angle (e.g. backlighting, wide-angle, close-up, fade-out, caligarism).
- **Explanations**. Symbolic interpretation of the meaning or theme (e.g. psychotic rage, oppression, dehumanization).
- **Emotions**. The emotions, thoughts or intentions of the characters (e.g. bored, happiness, despair) or your own emotions (e.g. boring, fascinating).

- Other. You can use other types of tags that are not described here.

(6). If the video you just finished was not your last video, please go back to the homepage by selecting the EFG logo on the top left. And play a new video. Do like this until you complete the five videos.

(7). If the video you just played was your last video, you can go to the "Questionnaire" link on the bottom left corner. You can also find the link here: surveys.timelessfuture.com/waisda. You can answer the questions in the questionnaire using your mother tongue (if it is English, Spanish or Dutch), otherwise, please use English. The questionnaire is anonymous. This is the **token** you can use for entering to it: **jsgigmdu**.

There is also a short screencast with the previous steps here: http://www.youtube.com/watch?v=r3yJUP0F-DU. Remember to activate the English subtitles to see the captions with the steps. If you have any doubts, problems with the game or questionnaire, or general comments, please don't hesitate to contact me.

Thank you very much for your valuable cooperation!

Appendix E. Questionnaire No.1. *"Waisda?"* game

This questionnaire was applied in Study A.

This is a set of 22 questions related to your experience with the game/experiment you participated in. It is divided into three groups:

- Personal/professional information (6 questions);
- Previous experience with indexing, tagging and/or labeling games (5 questions); and
- Your experience with this Waisda-EFG game (11 questions).

Your answers will be used for research purposes and the results will be available when possible. Please contact Liliana Melgar (lmelgar@bib.uc3m.es) if you have any doubts. Thank you very much for your participation!

PART 1. Personal / Professional information

Personal information questionnaire. Part 1 (Appendix C).

PART 2. Previous experience with indexing, tagging and labeling games

Personal information questionnaire. Part 2 (Appendix C).

PART 3. Your experience with this particular game (Waisda-EFG)

These questions are meant to know some aspects of the experience you just had in playing the game.

(12). Was coming up with tags difficult for you?

Please choose **only one** of the following:

1	2	3	4	5

Please choose between 1 and 5, where 1 is "very difficult", and 5 is "very easy".

(13). Were you able to enter all the tags you wanted to enter while watching the video? *

Please choose **only one** of the following:

1	2	3	4	5

Please choose between 1 and 5, where 1 is "it was not possible to enter all the tags I wanted to enter", and 5 is "I could enter all of them".

(14). Please describe or explain your choice in the previous question.

Please write your answer here:

You can point to the reasons why it was or was not possible for you to enter all the tags you wanted to enter.

(15). Please indicate if scoring was a relevant factor that motivated or demotivated you in entering more tags.

Please choose only one of the following:

1	2	3	4	5

Choose between 1 and 5, where 1 is "it was not at all influencial", and 5 is "it was extremely influencial".

(16). Please indicate if you entered tags in the following categories by dragging the boxes from the left to the right panel. You can leave on the left the boxes with the types of tags you didn't use. Please drag to the right at least one category.

Please number each box in order of preference from 1 to 5.

- **Cinematography**. Stylistic features, such as form, style, framing, camera movement, lightning key, type of shot, camera angle (e.g. backlighting, wide-angle, close-up, fade-out, caligarism).
- **Emotions**. The emotions, thoughts or intentions of the characters (e.g. bored, happiness, despair) or your own emotions (e.g. boring, fascinating).
- **Explanations**. Symbolic interpretation of the meaning or theme (e.g. psychotic rage, oppression, dehumanization).
- **Facts**. What you see or hear in the scene, such as objects, persons, places and actions (e.g. woman, sofa, London, R2D2, murder).
- **Other** type(s)

This question is about ranking. Please place on the top the type of tags you used most, and on the bottom the ones you used less. Leave on the left panel the categories you didn't use at all. Instead of dragging, you can also double click to move the box either to the left or right.

(17). If you chose or used the "Other" category in the previous question (16), please describe which types of tags you used.

Please write your answer here:

(18). Were the instructions you received by mail useful to help you know which tags could you use?

Please choose only one of the following:

1	2	3	4	5

Please choose between 1 and 5, where 1 is "not at all useful", and 5 is "extremely useful".

(19). If the instructions you received by mail were not useful for knowing which types of tags you could enter, can you please describe which kind of instructions would have helped you in coming up with more/better tags?

Please write your answer here:

(20). Given the case that tags or keywords were used to find these scenes later on, do you think that the tags you entered could be useful for others to find them?

Please choose only one of the following:

- Yes
- No
- Uncertain

Make a comment on your choice here:

(22). Had you seen the scenes/movies that were in the game before? Did you have previous background knowledge about these scenes/movies? *

Please choose the appropriate response for each item:

Clip/Movie	I hadn't seen this scene/movie and I didn't have any background knowledge about it	I had seen this scene/movie or I had background knowledge about it	I had seen this scene/move and I had background knowledge about it
Den Flyvende Cirkus			
Die Gezeichneten			
L'aiguille			
Metropolis			
Vampyr			

If you don't remember which scenes correspond to which title, please go to http://www.europeanfilmgateway.eu/ and search by title (you can see the clips there).

(23). General comments on this experiment, your experience in playing the game, additional reflections on any of the previous questions and/or suggestions for improving the Waisda labeling game. Your opinions about the idea of applying social tagging for films are more than welcome!

Please write your answer here:

Thank you very much for your valuable cooperation!

Appendix F. Session protocol and interview guide Study B

In Study B, each participant scholar attended a session of 1.45 to 2.30 hours in which they were interviewed, asked to perform activities (or tasks) and answer to two questionnaires. The structure of the session is detailed in §6.4.3.2. This appendix includes the detailed protocol followed during the entire interview session.

Introduction

1. Greet the expert, introduce myself, informal talk
2. Take our chairs, the participant organizes her desk, we prepare to work
3. If we will use her computer, I ask her to allow me check that the video player of her choice works properly
4. Start the Waisda site and check it is working (for Extra task)
5. I ask her for consent for pasting the folder with the videos in her desktop
6. In case there are technical problems, give my computer to the participant
7. Explain to the test participant the overall procedure of testing (be careful not to mention details that can influence their behavior (don't use the words "tags", "keywords, etc.):
    - This session will be 90 min. approx., better if possible, with no interruptions
    - The session is divided in three parts: in the first one, I will give you two "tasks" to do, with their instructions on how to do them; in the second one, we will do some extra activities and a very short questionnaire; at the end of the tasks, there will be another questionnaire that we can fill in together and an open interview where we can discuss more about this study.
    - You can talk about any aspect at any moment.
    - Finally: do you give your consent to record the session[190]. Any output from this session will be used for the research, but your name won't be associated or made public.

PART 1: Annotating. Work session (simulated information-annotating task situations)

8. Begin with **task one (Sim1)**:
    - Hand in the simulated situation (Sim1) to the participant and ask if it is clear[191]
    - Ask her to open the folder with the videos
    - She plays Clip1 and creates the annotation. In that time, I take observation notes
    - When the participant finalizes Sim1 one, I ask general questions (more to distress the participant, than to get any data: did you find it difficult? Are you ready to continue with the next task?

[190] I don't use a formal consent form for not scaring the participants, since this formality is not common in Spain.
[191] Figure 6.2 shows a translated version. The text was given to the participants in Spanish.

9. Begin with task two (Sim2[192]) –check list to see which correspond to the participant number: Sim2-a or Sim2-b, and repeat the previous steps (as in 8).

10. Open interview after first two tasks. These are the guiding questions:

- Did you perceive a significant difference between these two tasks?
- Which person or possible user of your annotations did you have in mind in task 1?
- Why did you choose this type of annotation in task1? And in task2?
- In task 2, why did you choose these (replace with type of annotation, for example "tags")? What was your motivation?

11. I ask if (s)he wants a short pause?

PART 2: Tagging. *"Waisda?"* game and tag qualitative evaluation.

(This section was excluded from the final quantitative analysis, only the audio recording data is analyzed). This part includes two activities: the *"Waisda?"* game, and a "tags" quality evaluation to encourage discussion.

- **Activity 1.** Play the *"Waisda?"* game
  - Explain very briefly what the game is about (purpose: matching)[193]. Give the paper with instructions to the participant to log in, be careful to emphasize that this does not relate to the previous tasks or contexts.
  - Clarify that they ONLY should tag these clips[194]: Clip 1: "Vampyr"; Clip 4: "Metropolis"; Clip 5: "Die Gezeichneten"
  - The participant starts playing the game
  - I write observations of behavior (recorder is on),
  - Comment openly about the experience. Hand in Questionnaire 1 (Appendix E, Part 3): "Your experience with this particular game (Waisda-EFG") to motivate the conversation, then complete the other two parts. Remember to clarify that the questionnaire only applies to the game activity, not to the previous tasks.

- **Activity 2.** Evaluation of tags from Vimeo or YouTube: Continue discussion about tags and their usefulness. For this use two motivating cases:
  - Case 1: Ask the participant if (s)he has uploaded a video to Youtube or Vimeo
    - In case it is positive, go to it and look if they assigned tags, ask them why did they select those tags, and if not, which tags would have they selected
      - Copy the assigned tags, if any
      - If there are no tags, ask why, and which ones (s)he would like to assign now (copy them)
    - In case the participant hasn't uploaded any video, ask her to select/write

[192] Sim2 had to variants indicating a slighly different use or purpose for the annotation: Sim1-a (Figure 6.3: teaching) and Sim1-b (Figure 6.4: research). The text was given to the participants in Spanish.
[193] The same guidelines as for the general *"Waisda?"* game used in Study A for the non-instructed group.
[194] The numbers correspond to the setting of Study A (§5.4.4). The setting used in Study A included five clips. For this activity in Study B, only the previous three were suggested to the participant.

down, ask them to select one clip or movie they are familiar in Vimeo (remember that YouTube does not show the tags!). If we do not find any video in 5 minutes, ask instead: which tags would she give to Clip 1 (Vampyr) in the case she uploaded it to Vimeo and discuss.

- Case 2: Ask the participant if she knows IMDB plot keywords –comment if so-
  - Ask the participant to search on IMDB for their own selected movie (Movie 1 (the same used in Sim1), and look for the plot keywords. (In case the movie doesn't have them, select another movie, or in a negative case, evaluate the keywords for "Vampyr")
  - Look at the keywords for the movie and ask the participant to evaluate if they are useful/relevant for the context/use that was assigned to him in Task 2 (education or research), and speak loud their reflections.

PART 3: Information needs and seeking behavior questionnaire

12. Hand in Questionnaire No.2 (Appendix I).
13. Stay while the questionnaire is filled in and encourage the participant to discuss or elaborate more on the questions about information needs and seeking behavior (the recorder is on).
14. Check that both questionnaires are completed.
15. Close the test session by collecting all sheets of paper.
16. Thank the test participant for the participation.

Post-session work:

- Write notes (reflections)
- Extract tags from Waisda
- Input survey answers to database
- Check that nothing is missing
- Contact the participant to thank, and ask in case something is missing or not understood from hand-writen texts
- Prepare for next participant
- Transcribe recordings in temporary system and do temporary broad pre-coding to check emerging issues

Appendix G. Technical details about the Clips/Movies

This appendix includes two elements: first, general details about the movies used in Study A and B (title, director, year, a brief background information, and plot outlines at the clip level). This is addressed to the reader of this thesis. Second, the sheet that was provided to the participants in Study B, exactly as it was handled to them, where all content information (synopses, keywords) was left out on purpose.

General details about the movies (clips) included in Study A and B (clip duration between brackets).

–**"Den Flyvende Cirkus".** (Alfred Lind, Denmark, 1912; [02:02]). Successful film by the Film Fabrikken Danmark production company. Directed by Alfred Lind (1879-1959), whose name is "inextricably linked with a large part of Danish silent film milestones", according to the Danish National Filmography (http://www.dfi.dk/faktaomfilm/person/da/127597.aspx?id=127597). The clip corresponds to an interior scene in a caravan bedroom, where one of the circus actresses talks to a monkey. (Clip obtained from EFG collection: http://tinyurl.com/p8cutp5).

–**"Die Gezeichneten"**. (Carl Th. Dreyer, Germany, 1922; [00:37]). Original title "Elsker hverandre" (Love one another). Directed by Carl Theodor Dreyer, recognized to be Danish cinema's most important director; not least in the international film history, he stands as one of the most important film artists (Danish National Filmography, http://www.dfi.dk/faktaomfilm/person/da/7401.aspx?id=7401). The clip corresponds to a short exchange between two men when one of them intends to take the coin of the other, who seems to be a blind beggar. (Clip obtained from EFG collection: http://tinyurl.com/nhrdpn6).

–**"L'aiguille"**. (William Piasio, Switzerland, 1961, [05:55]). Original title: "Die Weiche". Swiss short feature film produced in 1961. It is an unknown film from an unknown director. The EFG portal does not give detailed contextual information about it. Some film scholars think it is an amateur film, which combines different cinematographic techniques in naïve approach too basic for its time (November, 2014, personal communication with different Spanish film scholars). The fact of being a full film (short) instead of a fragment made it interesting for the experiment. The movie takes place at a train station, where one of the workers accidentally gets his foot stuck into a rail. (Clip obtained from EFG collection: http://tinyurl.com/l9yp4qg).

–**"Metropolis"**. (Fritz Lang, Germany, 1926, [01:30]). Fritz Lang's classic and renowned science fiction film, one of the greatest films of all times. The clip corresponds to the sequence where the robot Maria incites the workers to revolt. (Clip obtained from EFG collection: http://tinyurl.com/kmvmylh).

–**"Vampyr"**. (Carl Th. Dreyer, Germany/France, 1932, [01:36]). Also known as "L'etrange aventure de David Gray", is one of the most known films by Carl Theodor Dreyer and is "one of the founding and defining works of psychological horror cinema" (Rudkin, 2007). The clip

corresponds to one of the initial sequences, when Gray first begins to explore the world around, finding a silhouette of a grave digger shoveling earth, a shadow of a man with a wooden leg climbing up a ladder, ending with the first appearance of the old woman, Marguerite Chopin. (Clip obtained from EFG collection: http://tinyurl.com/otunuvv).

Technical details (sheet provided to Study B participants)

CLIP: Den flyvende Cirkus

Other title(s):
Der fliegende Cirkus [DE]
The pride of the circus [GB]
Det skandinavisk-russiske Handelshus
Genre: film
Country: Denmark
Year: 1912
Director: Alfred Lind
Script: Carl Dumreicher, Alfred Lind
Cinematography: Alfred Lind
Cast and crew: Rasmus Ottesen, Emilie Otterdahl, Richard Jensen, Lilli Beck (se alle)
Provider: Det Danske Filminstitut
Colour: sort-hvid
Sound: With sound

SHORT MOVIE: aiguille, l'

Other title(s):
Die Weiche
Year: 1961
Director: William Piasio
Cast: Charles Sully
Country: Switzerland
Runtime: 355 sec
Provider: Lichtspiel - Kinemathek Bern
Duration: 355 sec

CLIP: Vampyr

Other title(s):
Vampyr (L'etrange aventure de David Gray)
Allan Grays sælsomme hændelser
Vampyr (Die seltsame Geschichte des Allan Gray)
Country: Germany/France
Year: 1932
Runtime: 75.00 min
Director: Carl Th. Dreyer
Script: Carl Th. Dreyer, Christen Jul
Producer: Nicolas de Gunzburg
Cinematography: Rudolph Maté
Sound: Hans Bittmann
Composer: Wolfgang Zeller
Cast and crew: Julian West, Henriette Gerard, Jan Hieronimko, Maurice Schutz (se alle)

Appendix H. Types of attributes and semantic categories

This is a detailed view of Table 6.8 (*Classification No.7*, Clip 1: "Vampyr") in Study B.

Classification No.7 (Broad / Specific)	Sim1		Sim2		Total	
	(n)	(%)	(n)	(%)	(n)	(%)
Fact	**105**	**39.92**	**103**	**38.72**	**208**	**39.32**
characters (actions)	38	14.45	28	10.53	66	12.48
setting (place)	18	6.84	24	9.02	42	7.94
characters (traits)	23	8.75	13	4.89	36	6.81
objects and beings (traits)	13	4.94	19	7.14	32	6.05
kinds of persons, animals, things	4	1.52	7	2.63	11	2.08
character(s)	1	0.38	9	3.38	10	1.89
setting (time)	5	1.90	1	0.38	6	1.13
objects and beings (actions)	2	0.76	2	0.75	4	0.76
objects and beings	1	0.38		0.00	1	0.19
Cinematography	**73**	**27.76**	**94**	**35.34**	**167**	**31.57**
shot types	1	0.38	24	9.02	25	4.73
sound	14	5.32	7	2.63	21	3.97
soundtrack (music)	12	4.56	9	3.38	21	3.97
aesthetic movement	6	2.28	6	2.26	12	2.27
light	4	1.52	6	2.26	10	1.89
style	3	1.14	6	2.26	9	1.70
type of film/clip (length)	6	2.28	2	0.75	8	1.51
cinematographic value	2	0.76	6	2.26	8	1.51
effects	4	1.52	4	1.50	8	1.51
montage	3	1.14	5	1.88	8	1.51
color	3	1.14	3	1.13	6	1.13
framing	2	0.76	4	1.50	6	1.13
aesthetic influences	2	0.76	4	1.50	6	1.13
mis-en-scene	3	1.14	2	0.75	5	0.95
dialogs	1	0.38	2	0.75	3	0.57
camera movements	2	0.76	1	0.38	3	0.57
format		0.00	2	0.75	2	0.38
photography	2	0.76		0.00	2	0.38
rithm	1	0.38	1	0.38	2	0.38
narrative form	2	0.76		0.00	2	0.38

Classification No.7 (Broad / Specific)	Sim1		Sim2		Total	
	(n)	(%)	(n)	(%)	(n)	(%)
Other	**42**	**15.97**	**34**	**12.78**	**76**	**14.37**
unit being described	8	3.04	5	1.88	13	2.46
director	7	2.66	3	1.13	10	1.89
historical information	6	2.28	4	1.50	10	1.89
year of production	4	1.52	3	1.13	7	1.32
country or region of production	2	0.76	5	1.88	7	1.32
relation to movie (for clips)	7	2.66		0.00	7	1.32
title	3	1.14	2	0.75	5	0.95
extra-textual relation (relation to other films)		0.00	5	1.88	5	0.95
director's other production	2	0.76	1	0.38	3	0.57
director's background	1	0.38	2	0.75	3	0.57
extra-textual relation (adaptation of…)	1	0.38	2	0.75	3	0.57
director's importance	1	0.38	1	0.38	2	0.38
note about indexer's own familiarity with source		0.00	1	0.38	1	0.19
Explanation	**26**	**9.89**	**28**	**10.53**	**54**	**10.21**
theme or topic	4	1.52	14	5.26	18	3.40
genre or type (main theme)	7	2.66	4	1.50	11	2.08
interpretative clues about the characters	6	2.28	3	1.13	9	1.70
interpretative clues (purpose, meaning)	4	1.52	3	1.13	7	1.32
historical value	2	0.76	2	0.75	4	0.76
atmosphere	3	1.14		0.00	3	0.57
potential use (utility communities)		0.00	2	0.75	2	0.38
Emotion	**17**	**6.46**	**7**	**2.63**	**24**	**4.54**
atmosphere	9	3.42	3	1.13	12	2.27
characters (traits)	5	1.90	1	0.38	6	1.13
objects and beings (traits)	2	0.76	2	0.75	4	0.76
kinds of persons, animals, things	1	0.38		0.00	1	0.19
spectator(s)' mood		0.00	1	0.38	1	0.19
Total general	263	100.00	266	100.00	529	100.00

Appendix I. Questionnaire No.2. Information needs, seeking practices

This questionnaire was used in Study B – Part 3 (see also Table 6.2). It was made originally in English, and translated into Spanish for the participants. Only the English version is included next.

PART 1. Personal / Professional information

Personal information questionnaire. Part 1 (Appendix C).

PART 2. Information needs, seeking practices and willingness to participate

(1). Which are your main motivations for searching films or film content?

- For teaching purposes, using specific films or scenes in my classes
- For researching
- For production or reuse of film content in new productions
- For entertainment
- Other (please describe)

Ask for Real information need. When was the last time that you used moving images in your class? How did you find them?

(2). Please indicate your area or topic of specialization

(3). What type of film content do you usually study or use for your activities?

- Fiction films
- Non-fiction films
- Experimental/Art movies
- Broadcast material (not news)
- News

(4). What do you need more often for your work or research?

- Entire films
- Specific parts (scenes, shots) of a film

(5). What of the following examples resembles the types of requests that you have more often when you search? (please add a number from 1 to 3, where 1 means that it is not so common that you have that kind of need, and 3 means that it is a common type of need for you)

Example request	1	2	3
I am looking for the movie “Hotel Magnezit”, one of the first movies by Béla Tarr, I want to see if it is available online or if there is a film archive where I can go to watch it.			
I am looking for a scene of a mouse which was in a spaceship. It was in a black and white movie produced in 1929.			
I want to know which movies are about the problems that disabled people find to integrate in society			
I want to find scenes from any movie where there are people watching films at film theaters.			
I need high angle shots of people on ascending escalator			
I need still images of Hitchcocks’ cameos			
I need the title of a movie that was filmed by a Finish director based on a novel by Fedor Dostoyevsky.			
Where can I find a 'famous black and white shot circa 1940/50 of a couple embracing in silhouette in an alleyway at night'			
I need a film still of one of Tarkovsky’s movies where a house is burning			
I want to see different examples of movies that can produce happiness in the viewer			
I need to find scenes, sequences or clips where people are showing panic towards something unknown			
In which movie was that a woman was running desperate after a train?			
Other?			

(7). Can you please rank the following categories in order of the importance they have for you when searching for moving images? (add an ordinal number from 1 to 5, where 1 is the most important)

Facts. What you see or hear in the scene, such as objects, persons, places and actions (e.g. woman, sofa, London, R2D2, murder).	
Cinematography. Stylistic features, such as form, style, framing, camera movement, lightning key, type of shot, camera angle (e.g. backlighting, wide-angle, close-up, fade-out, caligarism).	
Explanations. Symbolic interpretation of the meaning or theme (e.g. psychotic rage, oppression, dehumanization).	
Emotions. The emotions, thoughts or intentions of the characters (e.g. bored, happiness, despair) or your own emotions (e.g. boring, fascinating).	
Other. You can use other types of keywords that are not described here.	

(8). Which of the following types of "keywords" or tags are common for you when searching for moving images' content? (please mark from 1 to 3, where 1 means that it is not so common that you have that kind of need, and 3 means that it is a common type of need for you)

Example keywords	**1**	**2**	**3**
Named persons or things (i.e. Jody Foster, William Ackman, Lassie)			
Kind of person or thing (i.e. woman, police woman, twin girls, dog barking, sofa, leather sofa, red slippers)			
Mythical or fictitious being (i.e. robotic ant, catwoman, alien)			
Named events (i.e. The Battle of Algiers, Uruguay vs Brazil or 1950 FIFA World Cup, Cannes Film Festival 1946)			
Kind of event, action or condition (i.e. weddings, hugging, unemployed people)			
Emotion or abstraction (i.e. smog signifying a polluted city, a shadow representing death)			
Named geographical location (i.e. Berlin, Xanadou)			
Kind of place (i.e. train stations, forests)			
Place symbolized (i.e. hell, paradise)			
Specific date or period (i.e. 1945, 80's)			
Cyclical time, season or time of the day (i.e. night, autumn)			
Emotion or abstraction symbolized by time (i.e. winter representing the fact of getting old)			

(9). How do you find your movies in your personal library?

(10). What do you do if you need a specific movie scene and you don't remember in which movie did you see it?

(11). Which are the tools and techniques that you mostly use when searching moving images? (please mark from 1 to 3, where 1 means that it is not so common that you have that kind of need, and 3 means that it is a common type of need for you)

Searching "tools"	**1**	**2**	**3**
General search engine (eg. Google, Yahoo!)			
Free online video services (eg. Youtube, Vimeo)			
Free online film databases (eg. IMDB, All Movie Guide)			
Proprietary film catalogs (eg. Film Indexes Online, Film Index International, American Film Institute catalog)			
Stockshots on the Web (eg. The British Pathè project, BBC motion gallery)			
Specific film archive catalogues			
Going or sending requests to film archives			

(12). When you search for moving images content by topic or subject using some of the tools you mentioned, which is more familiar and easy for you:

- I usually prefer to find and use "subject" lists (or "plot keywords") where I can pick up the term I am looking for
- I usually prefer to have a box where I enter my own keywords
- I usually prefer to find general categories from which I choose one, and then I observe the movies or clips retrieved to select what I want
- Other

(13). Participation in *nichesourcing* activities (please write or discuss your comments openly).

Because of the increadible amount of films that film and audiovisual archives have to deal with, the intermediary personnel (such as curators and librarians) cannot describe their content in detail. This description is necessary for access and dissemination. Even more, in certain cases, that staff does not have enough specialized knowledge in an area (e.g., film history, or audiovisual languge). For that reason, some initiatives such as *crowdsoucing* ask the contributions of many people with keywords in the form of tags, sometimes through games. But the lack of specialized knowledge of the general public, make those tags meaningless or not useful for being used in specialized settings. The question is: if a film archive (e.g., Filmoteca Española or a film association) would request your participation to contribute through an online system that would allow you to provide annotations, would you accept to do it voluntarily? I must indicate that this is a "hyphotetical" question, and that I do not represent any particular archive.

Appendix J. Interview guide Study C

This guide was used during Study C (as described in §7.5.2).

PART 1. Introduction

Explain to the participant that this is a conversation in which there is no right or wrong answer. Duration: 1 to 1 ½ hours: open questions and some activities using their own computers. Ask if I can record. Their answers will be kept anonymous.

PART 2. Background, research area, topics

Use personal information questionnaire (Appendix C) as a guide, do not ask just to fill it in, but to explain. Start commenting about their main area of research. This is to complement the information I already found out about them online and in publications. Encourage them to talk about this, but briefly (as a way to start):

PART 3. Situation 1 (research)

Ask the participant to provide a description of their main research project (it can be the current one or their most important or recent previous project. If it is possible to choose, it should be one in which they used films/moving images as primary sources. Ask them to describe:

–Motivation and project stages

–Why did they choose that topic?

–The research process, steps followed and methodology

–Sources

- The materials they used as their primary sources (ask about the importance of films or audiovisual in their research)
- How did they select the sources (mainly about the audiovisual sources) included in their research
- Why did they choose those specific sources (mainly the audiovisual ones), what kind of criteria influenced them in deciding sources were worth seeing/studying

–Information seeking (general)

- Describe how did they find/access the audiovisual sources for the described research (that is, how did they proceed in searching for the audiovisual sources for that research, the steps they followed)
- Explain which were the main sources/channels/systems that they used to find their sources (this is not only about websites or databases, but in general about institutions, persons, etc., we go more in detail later on about the systems to find moving images)
- Comment how often they use film archives, if they have examples of requests that they have forwarded to a film archive
- Ask them, in relation to audiovisual materials, if they mostly looked for entire films or specific parts (scenes, shots, stills)

- Comment if they had problems to find/access the films (audiovisual materials) they needed.

–Typical

- To what extent do they characterize the situation described as typically compared to other research scholars' situations?

PART 4. Situation 2 (teaching)

Think about the current courses in which they are teaching, or the past courses if they don't have now. Ask them to describe:

–Motivation and sources

–The topics/courses they teach

–The role of films or audiovisual materials in their classes

–How did they select the movies/sources they had to include in the courses, if they follow a text book. How do certain films become part of what should be thought (canon).

–Comment on the importance of surrounding documents, such as studio papers, posters, and critical reviews and how do they usually find those documents and use them in their research

–Information seeking (general)

- Ask them to describe how did they find/access the movies for the lessons, the steps they followed
- The main sources/channels/systems that they used to find moving images for their classes
- How often do they use movies, fragments or clips in their teaching activities
- If they had problems to find/access the films they needed for their classes

–Typical

- To what extent do they characterize the situation described as typically compared to other educational situations in their field

PART 5. Situation 3 (leisure / keeping up to date)

–Think about the last time they watched a film or audiovisual production

–How do they choose films to watch for their own "leisure", why do they usually decide to watch a specific movie

–Keeping up to date, how to keep up with current publications (videos, media, film productions)

PART 6. Information systems / searching behavior (general)

Which are the tools/systems that they use mostly for their research? Especially in relation to audiovisual materials or moving images

–Guide: ask openly first, then show first table and talk:

System type	Never	Rarely	Occasionally	Sometimes	Frequently	Usually	Every time
General search engine (eg. Google, Yahoo!)							
Free online video services (eg. Youtube, Vimeo)							
Free online film databases (eg. IMDB, All Movie Guide)							
Proprietary film catalogs (eg. Film Indexes Online, Film Index International, American Film Institute catalog)							
Stockshots on the Web (eg. The British Pathè project, BBC motion gallery)							
Specific film archive catalogues							
Going or sending requests to film archives							

–Then show second table and discuss further if they recognize those examples: how often do they use those following systems for their research and teaching activities:

System type	Never	Rarely	Occasionally	Sometimes	Frequently	Usually	Every time
Google or another general search engine							
Youtube							
Vimeo							
IMDB							
Movielens							
All movie guide							
Ina media Pro							
Beeld en Geluid							
European Film Gateway							
Europeana							
EUScreen							
British Pathé							
ITN Source							
BBC motion gallery							
Getty images							

ABC Video Source							
Stockfootage online							
Footage.net							
Internet archive							
Netflix, CinemaNow (other VOD)							
Movieclips							
BFI, EYE, or other film archives online							
The Media History Digital Library							
Thanhouser.org							
Proprietary film catalogs (eg. Film Indexes Online, Film Index International, American Film Institute catalog							
Others (please specify)							

- Activity guide: use the second form (table) as a basis for the conversation. Select the systems they chose as "Frequently" to "Every time" and make them come up with one example and do a demonstration of search based on the research case they chose, or in searches they have performed in the last month. Try to see and motivate the discussion about:
  - How they formulate their requests, types of needs/demands
  - How do they decide which results are relevant,
  - Observe which attributes they use to search and select results. Comment on the elements that are more important when they are exploring their results
  - Discuss the features of the systems that they use, how much is supported with the systems they use. I am not interested in the names of the systems, but in what they do and how they use them. Observe mainly how they use the tools to satisfy their information needs and ask them how do the main selected tools support their research, what advantages do they have, what is missing, what do they find relevant/useful or problematic.
- Ask if a portal such as "The European Film Gateway" be useful for their research. How would they use it and what would they expect it to include. Try to comment on their ideal film archive online (possibly do a demonstration on the use of the European Film Gateway for their current research topic and comment based on it)
- Ask them what do they do if they need a specific movie scene and they don't remember in which movie they saw it
- Comment on the role of serendipity and browsing
- Comment on how do they find/organize movies and clips in their personal library
- Ask them to comment how their research and teaching activities (mainly in searching films and moving images) changed with the appearance of internet and search engines such as Google
- Ask about their views on user generated content

PART 7. Situation 4 (analysis / annotation)

Coming back to the research case described in the beginning, situate them in the "analysis" phase. Comment:

- How did they use/analyze their sources (focused now on audiovisual materials)
- Comment if they usually do "close analysis of films"? (formal analysis of the sound and image track, the segmentation of the scenario/narrative, techniques of stylistic analysis)
- Ask them to rank the following categories in order of the importance they had for them when they were searching for moving images in their research situation.
  - **Facts**. What you see or hear in the scene, such as objects, persons, places and actions (e.g. woman, sofa, London, R2D2, murder).
  - **Cinematography**. Stylistic features, such as form, style, framing, camera movement, lightning key, type of shot, camera angle (e.g. backlighting, wide-angle, close-up, fade-out, caligarism).
  - **Explanations**. Symbolic interpretation of the meaning or theme (e.g. psychotic rage, oppression, dehumanization).
  - **Emotions**. The emotions, thoughts or intentions of the characters (e.g. bored, happiness, despair) or your own emotions (e.g. boring, fascinating).
  - **Other**. You can use other types of keywords that are not described here.
- Comment about their views on tags, if they are useful. Show example of EUScreen (do a search and ask them to focus on the tags)
- Ask them to comment on how useful would have been for them to find a facility to search by using time-coded film annotations such as in the two examples below (hand in sheet)[195].

Pilot episode of Twin Peaks:

Curtains00:35:3500:35:4492135Nadine's first mention of drapes

Curtains00:46:0000:46:0772760Nadine badgers Ed about the drapes

Curtains01:06:0901:06:19103969Nadine opening and closing her drapes

Curtains01:15:3401:15:4394534Nadine and Big Ed discuss drapes

Dreams/Dreaming00:16:3500:16:405995Bobby telling Norma, "I'll see you in my dreams."

Pleasures Of The World00:36:0400:37:36922164Cooper's opening monologue (trees, cherry pie)

Pleasures Of The World00:38:3100:38:43122311Cooper asks Truman about the trees in Twin Peaks

Pleasures Of The World01:20:3601:20:4484836Cooper telling Harry to "Smell those trees!"

Pleasures Of The World01:29:2101:30:00395361Doughnuts in the evidence room

[195] I wish to express my acknowledgements to Dr. Gary Geisler for providing these examples (personal communication, February 14, 2014).

Hitchcock's Vertigo:

motif name, start_time, stop_time, duration, start_time_in_secs, note

Handbags00:55:0600:56:17713306Madeleine takes a letter from her handbag and puts it in Scottie's letter box

Handbags00:49:1500:50:05502955Scottie retrieves Madeleine's handbag holding her hair pins

Staircases01:16:2501:17:11464585Scottie ascending the church tower for the first time

Staircases02:02:4602:05:521867366Scottie ascending the church tower for the second time

Staircases00:31:2700:31:48211887Scottie ascending stairs to Carlotta's room

Heights and Falling00:04:1000:04:5848250Scottie hanging from the roof top

Heights and Falling00:11:0100:11:1716661Scottie experiences vertigo standing on a stool

Heights and Falling01:16:3701:16:4144597First instance of Scottie's vertigo in the church tower

Heights and Falling01:16:4701:16:5034607Second instance of Scottie's vertigo in the church tower

Heights and Falling02:03:1602:03:1937396Third instance of Scottie's vertigo in the church tower

Heights and Falling02:03:3302:03:3637413Fourth instance of Scottie's vertigo in the church tower

Heights and Falling01:16:5901:17:19204619Madeleine falls to her death

Heights and Falling01:24:5201:25:20285092Scottie falls into the abyss in his nightmare

Heights and Falling02:07:4002:08:05257660Judy falls to her death

Heights and Falling00:42:5000:43:10202570Madeleine falls/jumps into the bay

Cameos00:11:1800:11:235678Hitchcock walks by Stewart

- If there is room for more discussion, talk about the initiative “La ligne du temp” (http://web.iri.centrepompidou.fr/pop_site.html)
- Hand in personal information questionnaire (Appendix C) (discuss Part 2, “Experience with indexing”). Try to motivate them to comment which their views are about indexes, tags, subject headings.
- Ask them to commen whether they use a specific information system (e.g., QDA) to help them in their research, or for formal analyses.
- Conclude the session.

Appendix K. Brief History of Film and Media Studies

As Kuhn and Westwell (2014c) explain, this field of film scholarship is relatively new compared to other disciplines, since the first university programs appeared in the 1950s. The origins of film studies can be traced back to the beginning of the medium (c.a. the 1890s) when critical writings about it started to appear, and to the 1920s when several special journals and other publications devoted entirely to the medium were published. The inclusion of film studies in education apparently began when in the 1930's courses on "film appreciation" started to appear in the school curricula (mostly in the UK) in order to educate children and "control a new form of entertainment".

As a university subject, its origin is still controversial, since its inclusion as an academic field was subject to debate at least until thirty years ago, the reasons being that film was considered both popular culture or a mass entertainment industry (Casey B. & Mortimer, 2013, p. 3; 15), which made difficult the recognition of its academic status. Some research has shown that first courses appeared in the US as early as the first decade of the twentieth century, but it is common to see the 1950's as the start of film studies as a scholarly field (Casey B. & Mortimer, 2013; Kuhn & Westwell, 2014c). Between 1965 and 1975, film studies grew tremendously as an academic discipline in American universities, from around two hundred people offering courses, to around one thousand a decade after (Elsaesser, 1986, p. 246).

Although the idea that film is but one of the several media was already pointed out in the 1920's (Kolker, 2008)[196], the term **media studies** seem to be more recent. Indeed, even though Marshall McLuhan used the term "media" in his foundational work for "medium theory" the mid 1960's[197], "media studies" as a university discipline is reported to have appeared in the 1980's: "With the development of new academic subjects in the 1980s and 1990s, film courses were often subsumed into media and communications or cultural studies where the specificity of film was again lost (Casey B. & Mortimer, 2013, p. 16), or even later: "In the mid 1980's, television studies was incorporated into the organization's mandate, followed by media studies from the late 1990s" (Society For Cinema and Media Studies, 2015). In this sense, film studies are older than media studies, but they still share some content and approaches (Casey B. & Mortimer, 2013).

Media studies denote a stronger emphasis in the different systems of communication or entertainment, of which film is but one. The term "media studies" alone is usually used interchangeably with "mass communication" (Valdivia, 2003, p. 1), which is closer to methodologies of sociology and cultural history (Kolker, 2008, p. 9; Kuhn & Westwell, 2014d). Downing, Schlesinger, Wartella, & McQuail (2004) explain that there is no established definition of the fields of **communication and media studies** but that different studies agree on finding the origin of the field in the phenomenon of mass communication, which was first labeled as such in the 1930s. Downing et al., further describe the so-called "new mass media" of the time, which included film, phonograph, and radio that appeared in the industrialized world between 1895 and 1920. This author clarifies that newspaper and magazines were published long before, but they became a mass medium at the end of the 19th century; with television joining the group by 1950.

Kirkegaard (2009), in the context of a similar investigation as the one presented in this thesis, about the IB of media and communication scholars, defines media studies as follows[198]:

[196] Original quote: "I am aware of the risk of setting up a false comparison between film and media studies for the sake of argument. I have already pointed to Gilbert Seldes's study of film as one medium within the cultural surround of the 1920s. The Frankfurt School examined media, film included, within larger, profoundly political and cultural contexts, work that pointed the way to media studies." (Kolker, 2012)

[197] As explained in Downing et al., (2004). The original title of McLuhan's 1964 book is "Understanding media".

[198] His citations apply mostly to studies in Denmark.

> "Media Studies is the study of mass media in its historical, cultural and social context. This includes audiovisual media, e.g., Bondebjerg's (1993; 2006a) focus on television broadcasts, traditional media, e.g., Poulsen's (1999) investigation of newspapers, as well as new media, e.g., Finnemann's (2005) focus on the Internet. The field comprises all types of communication, e.g., art, entertainment, news, commercials, and interactive communication. The focus is contemporary as well as historical (e.g., Jensen, 1996-2003; Hjarvard, 2006b)" (Kirkegaard, 2009, p.5).

Media studies also tend to draw methods from the social sciences to study processes of communication and reception (Kuhn & Westwell, 2014c). However, film and media scholars define themselves as humanities scholars:

> "As humanities scholars, we distinguish ourselves from those pursuing social science methodologies and mass communication approaches to media, while recognizing important and productive links. Cinema and Media Studies emphasize the cultural and historical importance of media and focus on the production, circulation, and reception of texts and representations, which are analyzed in terms of aesthetics, meanings, and uses" (Society For Cinema and Media Studies, 2015).

However, the boundaries of the film studies, media studies and cultural studies disciplines are in constant transformation, and it is not possible to present a stable definition. Additionally, as one of this study's interviewees commented, with the tendency to have "media history" and "film history" as fields on their own, it is becoming more difficult to integrate the different approaches (c,p2-e,. Although this participant was referring to this difficulty in relation to study programs for undergraduate curriculum, the disparity also applies to research[199].

Additionally, there are no clearly delimited research areas within film and media studies. Indeed, as Chapman, Glancy, & Harper (2009) indicate, "all historians work within particular intellectual and cultural contexts that influence the nature of their work, the specific questions they ask and the methods they apply". These contexts have varied during film and media history, changing the approaches to the study of film and media. Understanding these changes is the purpose of a discipline called "film historiography" (also understood as "meta–film history" in Elsaesser (1986)'s words), which is of increased interest among film and media historians, and a subject of research on its own (Casey B. & Mortimer, 2013, p. 15).

According to Chapman et al. (2009, p. 2), there were basically two "paradigms" in the traditional history of film studies: one focused on the history of film as an art form (which they call the "aesthetic tradition"), the other about the idea of film as a reflection or mirror of society (what Kuhn & Westwell (2014c) call the "sociological perspective"). Since 1985, a new turn in doing film studies was identified and then called, "new film history" (Elsaesser, 1986). The "new film history" approach defined and drew new directions to the work of the film and media scholar, giving prominence to the understanding of films in their production and reception contexts (Kuhn & Westwell, 2014e).

Branigan & Buckland (2014) groups and explains the main film theories to date in the following four types:

[199] Specialization and separation are an international trend, which this participant was critical about (SC,p2), suggesting going a step back into more traditional approaches in which existing fields (e.g., gender studies, or literary studies) would look into media. Likewise, television studies and film studies have many things in common, as media industries and phenomena that belong together somehow, but their theories have indeed divergent origins (SC,p4). However, because the intention of this study is not historiographic, that is, it does not attempt to add to the scholarly epistemological concerns of the characteristics of film and media studies as a discipline, it does not include further discussion on this topic.

(1) Semiotic theories, characterized by an objective approach that looks for visual language patterns (e.g., Sergei Eisenstein, Christian Metz, and Umberto Eco),

(2) Communication theories, which focus on the exchange between authors and viewers (e.g., Francesco Casetti),

(3) Language approaches that examine subjective regularities of the psychic or emotional states of a viewer (e.g., cognitive theories that provide frameworks for the examination of audience engagement, such as Nicholas Carroll or David Bordwell); and

(4) Inter-subjective approaches, that look at how spectators make sense of a film. This is studied by authors such as David Bordwell, Robert Stam, David Black, and writers in other fields such as George Lakoff, Mark Johnson, and Roland Barthes.

A central concept of traditional film history, as well as to other fields such as Literature studies, is the “canon”, a series of core works that represent the best of the medium and have been crucial in supporting the claim of film as an art form (Casey B. & Mortimer, 2013, p. 4). Debates about the canon are central to this discipline, and especially to “new film history”.

Appendix L. Introduction to transtextuality applied to media

This appendix presents a brief introduction to the concept of "transtextuality" proposed by literary critic Gérard Genette. It also presents a literature review of the studies that have looked at the application of Genette's concepts to the realm of films and media.

As suggested in Chapter 2 (§2.8), scholars are active in "annotating" their sources, not precisely with the purpose of facilitating future retrieval for others, but with the aim of apprehending, analyzing or interpreting those sources for research or educational purposes. These analyses are performed from different perspectives or traditions that have historically attempted to understand moving images. Thus, together with the history of films there is the history of the discourses about them. They precisely constitute the so-called film theory. Those different theories have attempted to provide frameworks for the interpretation of film and media works (the main film theories include, for instance: auteur theories, semiotics and structuralism, psychoanalysis, genre theory, national cinemas, marxism approaches, or feminism). Because film is considered part of the world of human artistic creations and also a medium of expression, interdisciplinary relations are common.

Even though it is not the purpose of this thesis to contribute to the reflection about the interdisciplinary relations of LIS with theories in other fields, this connection became necessary to understand the phenomena that this thesis deals with. As it was the case in Study A, concepts from other disciplines, such as theory of art, were influential in determining semantic categories for the analysis. Likewise, in Study B, the most relevant concept was that of "**transtextuality**," proposed by literary scholar Gérard Genette[200]. Briefly summarized, the five aspects that Genette defined were part of transtextuality are: (1) "intertextuality," (2) "paratextuality," (3) "metatextuality," (4) "hypertextuality," and (5) "architextuality." Genette clarifies that the five aspects above should not be regarded as exclusive categories, but as interconnected aspects of transtextuality. For need of simplification, only the second, third, and fifth concepts are briefly discussed here after a short definition of each aspect, as those three ones are of especial importance in this thesis.

The first aspect, "**intertextuality,**" indicates a relation between texts in the form of co-presence, that is, "the actual presence of one text within another," in the form of quotes, or even plagiarism or allusion (p.2). Citations, in this scope, could be regarded as a form of intertextuality. The **hypertextuality** aspect in Genette does not mean (only) what the term "hypertext" evokes in common and technical language use. It indicates that two texts (A, B) are related, not via explicit mention of A by text B, but via an essential connection, in which text B could not exist if text A did not exist before. This relation is highly interesting for media analysis (and literary analysis in general), and is the type of transtextuality in which domain knowledge would be required at the highest level of expertise. For instance, by determining that a media work is "parody" of another work.

In Genette's work "Palimpsestes: Literature in the Second Degree" (1997a), originally published in 1982[201] he proposes a redefinition of his original concept of "**paratextuality**," which he presented initially in his book "The Architext: An Introduction" (1992), initially published in 1979. According to the self-revised version of the concept presented in "Palimpsestes," transtextuality refers to the "textual transcendence of the text" (p.1), which could be understood as an intrinsic aspect to every text that makes it go beyond its singularity as a text (the last one being the object of

[200] I could certainly agree with Genette, in that "the trouble with "research" is that by dint of searching one often discovers… what one did not seek to find" (1997a, p.1), but I acknowledge that it has been an insightful and pleasant re-discovery.

[201] Originally published as: Palimpsestes: La Littérature au Second Degré, Paris,. Éditions du Seuil, 1982, 468 p.

critique). The paratextuality aspect is later studied by Genette in a separate book, "Paratexts: Thresholds of Interpretation" (1997b). There, the main concepts suggested by Genette are summarized in its formula: paratext = peritext + epitext. **Paratext** is a term that encompasses all productions inside (i.e., **peritexts**) and outside (i.e., **epitexts**) the main text. They are a kind of "threshold" that "mediate the book to the reader" (1997b, p. xviii). From the realm of books, examples of peritexts are the preface and the introduction (also content footnotes, endnotes, preface, foreword and the content pages: index, titles, and subtitles, or chapter synopses). These contribute to the meaning of the text, framing its value within the work (book) itself. Epitexts can have the same function but additionally contribute to the interpretation of the text from outside (for instance, in the form of letters or interviews).

In relation to the **metatextuality** aspect, Genette explains that it is a "commentary" relationship, which "units a given text to another, of which it speaks without necessarily citing it (without summoning it), in fact sometimes even without naming it" (p.4). The **architextuality** aspect, the most abstract and most implicit according to him, roughly corresponds to the mentioning of categories and classifications that one text makes of another text, "as when the indication *A Novel,* or *A Story*, or *Poems* is appended to the title on the cover), but which remains in any case of a purely taxonomic nature" (p.4).

Genette's concepts come from the domain of literary theory and are originally book-centered. However, their use has spanned to other disciplines and media. Åström (2014) reports on a study about the use of paratextual theories in other domains, through a co-citation analysis of nearly two thousand references to works by Genette in around seven thousand articles indexed by the "Web of Science" databases. Åström finds that the most important context of use of Genette's concepts is indeed the field of literary studies, but he also finds a relatively strong connection to a more general humanities-oriented theoretical field; however, the representation of articles from other research fields is low.

The richness of the potential use of Genette's concepts in media theory is reflected in the recent compilation made by Desrochers and Apollon (2014), who present several studies applied to the interpretation of digital objects and digital culture. Their compilation includes research about paratexts not only in the realm of books, but of digital media, videos, games, or transmedia storytelling. Åström's (2014) study found indeed, to a very low extent, though, that the concepts above have been already applied to the analysis of film and media.

Representative works about the use of Genette's concept in film and media studies include Stanitzek (2005), who used the term "cinematic paratext" (§2.7), explaining that the concept of paratext in film studies was identified relatively quickly, "as both a practical and necessary addition to the film semiotic notion of the text" (p.36). He observes that Genette's concepts apply clearly to films (e.g. for instance titles, subtitles, intertitles can be defined as peritexts; and film posters, trailers, and stills as epitexts). Burt (2007) also writes about the "cinematic paratext", presenting some examples: e.g., opening title sequences, trailers, movie posters; interviews with filmmakers and historian consultants; which are also used in digital and electronic media, for instance in a DVD's audio commentaries by directors and historians, deleted scenes, animated menus, official film websites, fan websites, or trailer websites. In addition, the varied forms of paratexts have been comprehensively analyzed by Gray (2010) in his book entitled "Show Sold Separately: Promos, Spoilers, and Other Media Paratexts". Examples of paratexts studied by Gray include ads, previews, trailers, interviews with creative personnel, internet discussions, entertainment news, reviews, merchandising, guerrilla marketing campaigns, fan creations, posters, games, DVDs, CDs, and spinoffs.

Indeed, in current times we experience a "veritable explosion of paratextual forms" (Stanitzek (2005, p.39), a proliferation of "peripherals" (Gray, 2010, p.5), an "eco-system of paratextual phenomena whirling in the 'slipstream' of bits' (Desrochers and Apollon, 2014, p. xxxiii). This

explosion increases in the context of a current participatory authorship culture and "user-generated content" (UGC), in which digital availability and transformations of texts and media are enabled by several reading and access devices for "dynamic viewing practices" (McCracken, 2013), for instance through mashups or remixes. In this scenario, there seems to be a need for novel definitions of the concept of paratexts, which McCracken (2013) suggests by using the terms "centrifugal" and "centripetal vectors" as a way of extending Genette's concepts to the analysis of digital textuality, in this case on portable electronic devices. As McCracken (2013, p.107) explains, while reading an e-book, readers can engage with blogs, other readers' comments, and the like, that can be accessed via the same reading device ("centrifugal vector"), and they can also change fonts, or presentation formats of those texts ("centripetal vector"). These concepts are used by Simonsen (2014) to explain the paratextual phenomenon in the case of YouTube. Likewise, Bhaskar (2011) also proposes the term "paracontent", wider in scope, to explain the emergent and evolving forms of content that arise in the digital landscape. However, as Desrochers and Apollon (2014) argue, Genette's terms are still valid and preferred.

Coming back to the concept of **metatexts**, which does not seem to be well developed by Genette himself, other researchers have approached it in different ways. For instance, Pallat (2013) associates this concept with the term "metadata" and looks at the role that it plays in translation (allowing identification, tracing back to editions and translations in time). Fløttum et al. (2006) studied how metatexts have a function in academic prose (within the text they can refer to sections of a document, for example through the use of expressions such as 'in this article/section'). These terms mostly refer to the world of text publications, in which the degree of annotation can be high, for instance in "critical editions." However, current computational linguistic mechanisms could certainly make use of these metatextual hints within the textual content for the purpose of enabling retrieval.

In this thesis, the concept of "metatext" has been used as a kind of "annotation" (§6.6). For instance, abstracts or synopses are regarded as a type of metatext of the type "natural language representation". Considered that way, a work about "metatexts", which does not explicitly use this term, but implies the concept, is Bondi and Loréns Sanz (2014), a study of the role of abstracts in academic discourse. In general, studies of abstracts from an IR point of view are common and include research on automatic generation or extractive and multi-document summarizations. As Castel (2006) indicates, a great body of research applies to the "Research Article Abstracts" (RAA), which is the focus of numerous investigations within linguistics and NLP, also in studies about text parsing which aim for automatic text classifications and retrieval.

There are different techniques for analyzing these "natural language representations" (NLR) or meta-textual forms for information processing. Most of them come from the fields of linguistics (e.g., Goddard, 2011; Koopman et al., 2013), basic techniques for discourse analysis (e.g., McCarthy, 1991), NLP (e.g., Jurafsky & Martin, 2008), or machine learning, which apply quantitative corpus analysis methods, where parsing or segmentation and mining at different levels is used. The most important techniques include, for instance, segmenting by groups of sentences, individual sentences, phrases, clauses, syntactic or semantic constituents, words, entities, named entities, keywords, topics (e.g., Purver, 2011), or triplet extraction applied to summarization (Rusu, Fortuna, Grobelnik, & Mladeniæ, 2009). A relevant application of content analysis to the study of surrogates is described by Tibbo (1993), who analyzed abstracts of historical literature through coding at the sentence level. Likewise, Albrechtsen (1993), Pejtesen and Austin (1986, as cited in Pejtersen 1994), and Pejtersen (1994) report on the use of discourse analysis techniques to the subject analysis of fiction literature. Approaches that go beyond the use of metatexts analysis for the purpose of retrieval include, for instance, the automation of abstracts evaluation created by humans (e.g., by students), using methods of latent semantic analysis (for example in Venegas, 2011). The cognitive theory and the polyrepresentation principle have also considered the possibilities (advantages and disadvantages for IR) of

introducing these NLR into the process (Ingwersen, 1996).

However, research about the analysis of film or media metatexts applied to moving image indexing and retrieval (not even to mention paratexts) seems to be scarcer. Research in this area originates in other domains. The most representative publication revising the application of quantitative content analysis and qualitative textual analysis techniques applied to media works in a semiotic tradition is the encyclopedia article "Mediated Fictions" (P. Larsen, 2012). Other few exceptions that may indicate valuable aspects that could be used in information processing may be found in the studies presented above in relation to cinematic paratexts. For instance, Gray (2010) illustrates through examples the characteristics of press reviews and discusses other types of critical paratexts. In film studies and theory, the most valuable work at this level is presented by film critic David Bordwell, who in his book "Making Meaning" (1991) analyzes in detail the characteristics of film reviewing and media criticism from a "rhetorical" approach, that opens the doors for future textual analyses of NLR applied to media. In addition, there may be few but representative examples on how the analysis of paratexts helps to understand film history, for instance, Lefebvre (1993), who examines the role of different texts available outside and inside the projection room in early cinema reception. From an IR perspective, a few studies analyze the broader area of abstracts in fiction retrieval (e.g., Pejtersen, 1994) and indexing and abstracting of imaginary works (Lancaster, 2003). Moreover, a few recent studies analyze user reviews or comments (§2.5.1) in the context of online video sharing. For instance, Madden et al.'s (2013) study about how users express themselves and communicate through comments in a video sharing platform, or Wollmer et al.'s (2013) study of the commentator's sentiments in online videos, more specifically for movie reviews. Sentiment analysis (Ghorbel & Jacot, 2011) is indeed an important area of application of textual analysis to the study of film reviews (a form of paratext). The study by Wollmer et al. (2013), approaches the comments' analysis not only from textual information, but in combination with video features, and audio features using speech-based emotion recognition.

Finally, paratexts and other transtextual connections are not only important from an eventual application of the polyrepresentation principle from an IR perspective. Gray presents an enthusiastic analogy of all these accompanying para-texts with the bridges, routes, parks, beaches and leisure sites of a city populated with media. Explaining his analogy, he writes:

> "They tell us about the media world around us, prepare us for that world, and guide us between its structures, but they also fill it with meaning, take up much of our viewing and thinking time, and give us the resources with which we will both interpret and discuss that world." (Gray, 2010, p.1)

Gray's analogy provides a clear suggestion of the highly important value of paratexts in supporting the interpretation and circulation of media works, by helping us decide which texts to read or "consume." Likewise, Stanitzek (2005) highlights their importance in television programming. In general, paratexts fulfill a mediating function, aiding the dissemination and reception of literary, or media works, in this case, within society.

As commented above, the application of Genette's concepts in other disciplines outside literary studies is not common, and their particular use in LIS research is lesser and more peripheral (Åström, 2014). Of the few available works, representative studies are Andersen (2002), who argues that the bibliographic record is in itself a piece of text, which embodies different levels of social and discursive action. Andersen claims that one of the implications of this view is that, within knowledge organization research, providing access to texts and works is not only a technical but also a literate problem. In the same direction, Paling (2002) argues that the concept of paratext can even help to bridge the gap between two bodies of scholarship, namely information studies and rhetoric. Indeed, as Stanizek (2005) explains, paratexts create a kind of "zone" where communication acts take place:

> "And thus the paratextual zone is observed to be a sphere of mobile, fragile, unstable, improbable relationships, a place of contacts and contracts and communication, or, as Genette puts it, of "transaction" (1997, p.2). Numerous social, economic, technical, and material references are discovered; these are not irrelevant to the text but give indications of its internal working,[25] showing it to be indeed a dispersedly organized and diverse structure. These references open up opportunities to raise social-historical, economic, media-historical/discourse-analytical, communication-theoretical, and gender-related questions and to read texts in these various manners, which makes the concept so attractive (Stanitzek, 2005, p.33-34).

The high importance of paratexts for media, as shown above, agrees with Andersen and Paling and calls for the integration of paratextual concepts within indexing theory and IR research applied to media. From a theoretical angle, Genette's concepts could perfectly be adopted in LIS conceptualizations that take a broader approach to indexing by incorporating concepts and methods from linguistics, semiotics, literary studies, and communication[202]. Authors supporting this view are for example Jens-Erik Mai (e.g., Mai, 2001), Elaine Svenonius (e.g., Svenonius, 2004), Rafferty and Hidderley (2005), and others in which their works are based (e.g., Cronin, 2000, Smiraglia, 2000; and Buckland & Day, 1997, as cited by Mai, 2001). These authors claim that indexing is a process in which interpretation takes place through meaning construction and communication, and theories of document and knowledge representation should deal closely with the problem of meaning and language. Indeed, as Gray (2010), from the paratextual theory of film works indicates, "the study of paratexts is the study of how meaning is created, and of how texts begin" (p.26). Andersen and Christensen (1999, as cited in Weinberg, 2009), in a similar linguistic approach to indexing theory, apply the ideas of Ludwig Wittgenstein to indexing, suggesting that "this process must take into account the social, historical, and linguistic contexts of documents." The cognitive view point in which the IS&R framework is based also has a high linguistic and communicational component, since the principle of polyrepresentation, not explicitly based on theories of transtextuality, implicitly develops and acknowledges them. This makes the framework closer to the "socio-cognitive" approach to representation (Jacob & Shaw, 1998) since the emphasis is on the actor of the seeking processes, with important attention to communication practices and domain contexts. To date, major attention has been focused on the scientific domains. Larsen (2004) indicates:

> "Because the rhetorical structure of scientific articles within a field has evolved in a continuous communication effort between active researchers over long time, these functional representations are socio-cognitive, and can be regarded as the distilled knowledge structures of a large number of actors. Indeed, investigations of the development of document types or genres (See, e.g., Swales, 1990) may be helpful in identifying representations with strong functional characteristics for use in IR." (Larsen 2004, p.28)

This thesis suggests that in the humanities disciplines, transtextual theories are helpful in identifying representations in those domains. Some efforts in that direction were found during the course of this exploration. More specifically, in the audiovisual domain, Stockinger (2013) presents an approach to the interpretation and indexing of digital audiovisual corpora based on the semiotics of the audiovisual text. Stockinger (2012, 2013) is one of the few authors who investigate the application of semiotic principles and techniques to the domain of audiovisual indexing. Also, Rafferty and Hidderley (2005) propose the idea of "democratic indexing" inspired by the semiotic framework of pictorial works, which considers a wide range of possible meanings and user interpretations.

[202] e.g., the fields of discourse and content analysis

In sum, the aforementioned authors seem to agree on the necessity of considering indexes as less rigid forms of communication, which agrees with the broad view of "annotation" proposed in this thesis and which is particularly studied in Chapter 6. Even though it is not within the scope of this thesis to elaborate on the epistemological implications of these ideas, the findings which have resulted from the small scale test performed in Study B serve as a starting point for this type of integration of paratextual theory into the study of media annotation and (poly)representation.

Appendix M. Information sources used in film scholarship

This appendix includes a compilation of different types of websites, reference works, or online databases mentioned by scholars during Studies B and C[203]. The resulting compilation is not comprehensive. Its only purpose is to present, in a categorized way, the sources that were mentioned by the scholars interviewed during this thesis. It is included as one of the by-products of the thesis' analyses since it seemed to be valuable for researchers, as they commented when it was distributed to some of them after the studies. The list was created in March 2014 and it was revised in October, 2015 by this thesis' author.

Relevant reference sources that are comprehensive are:

–Perrault et al., (2012). A guide to information resources in the Humanities and the Arts, which includes a section on Performing arts with valuable sources for the study of moving images, and a section on Visual arts.

–López de Solis, 2014. A guide to resources that can guide the work of the so-called "film researcher." In addition, there are serveral publications that support the task of "footage finding."

–Mattison, 2004. A compilation of databases and resources for finding moving images of all types. Even though it is ten years old, many resources are still valid.

Film literature indexes (periodicals)

- **The FIAF databases (International Index to Film Periodicals Plus)**. This resource is maintained by the International Federation of Film Archives (FIAF) since 1972. It contains five databases: (1) The Index to Film periodicals, (2) Treasures from film archives, (3) Documentation collections, (4) FIAF affiliates' publications, and (5) Reference works. The index is created through contributions from different archives in the world who index the periodicals (i.e., journals and magazines) at a high level of granularity according to a template provided by the association. It is searchable by topic through a film specialized thesaurus, not only by film title, adding a form of access unavailable through other databases. The International Index for Film/TV Periodicals includes references and partial full-text access to more than 300,000 articles, reviews, and other information from more than 300 periodicals from around the world. In 2007 ProQuest launched the FIAF International Index to Film Periodicals Plus, which offers immediate full-text access to articles in more than 40 magazines indexed in the database. The other three databases are "film databases," which are included in the next category.
- **Film Indexes Online Proquest Information and Learning** (online subscription database through Chadwyck-Healey film resources). This resource is comprised of three valuable resources that have been brought together online under a single portal. The databases are Film Index International, the American Film Institute Catalog, and FIAF International Index to Film Periodicals. Subscribers to Chadwyck-Healey Film Indexes Online can search across these three resources or search the individual databases separately.
- **American Film Institute Catalog** has long been a standard for American film information. Its scope is the history of American film from 1893 to 1974, with records for selected major films from 1975-2008. The print catalog is updated annually. This database is also updated twice per year.

[203] This list will be made available at this website: https://collaborativearchives.wordpress.com/.

- **Film and Television Literature Index** with full text (EBSCOhost). Covers resources from some 300 periodicals, which are scanned for pertinent articles. Recenty, it has included television periodicals as well. Since it was first issued in 1973, in print as *Film Literature Index,* it has developed an excellent reputation not only for its coverage of some 160 journals from 30 countries but also for its organization and ease of use.

Film databases and filmographies

- The Internet Movie Database (IMDB).
- **Film Index International** offers records on international films that were released over the past 90 years and indexed by the BFI. The database is updated twice each year and now consists of over 128,000 film records and more than 880,000 records on persons working in the film industry. This is a rapidly growing tool; for example, in 2009, 700 film and 21,000 person records were added. The record on each film includes information on director, cast, crews, year of release, production information, and awards (if any). A synopsis of each film is included. Person records give biographical information, awards (if any), and films in which the individual appeared. There are references from film journals included within the records, and also links among the records so that the user can navigate between them.
- **The Premiere Database** (interface in Danish only) is an internal version of the National Filmography and includes approximately 25,000 titles of Danish and international films (with reviews). Apart from the titles in the National Filmography, the database includes many Danish shorts and documentaries, as well as foreign features premiering in Denmark since 1980. It is furthermore possible to search among approximately 120,000 individuals. The database is maintained by the Library, the Stills & Posters Archive and the Film Archive.
- **AllMovieGuide** (http://www.allmovie.com/)

Audiovisual databases

- **Film or television archives regional aggregators**
  - European Film Gateway (http://www.europeanfilmgateway.eu/)
  - Euscreen (http://www.euscreen.eu/)
  - Film archives online (http://www.filmarchives-online.eu/)
- **Individual film archives or national institutions in charge of audiovisual heritage**
  - BFI (http://www.bfi.org.uk/)
  - Cinemexicano (http://www.imcine.gob.mx/cine-mexicano)
  - CNC: Centre National du Cinéma et de l'image animée (http://www.cnc.fr)
  - Europeana (http://www.europeana.eu/)
  - German Film Portal (http://www.filmportal.de/en)
  - The Margaret Herrick Library (http://www.oscars.org/library)
  - The moving image archive of the Internet Archive (http://archive.org/details/movies)
  - UCLA Film and Television Archive (https://www.cinema.ucla.edu/)
- **Television archives or mass media related collections**
  - Beeld en geluid (http://www.beeldengeluid.nl/en)

  - Database of the Paley Center for Media (http://www.paleycenter.org/collection)
  - Ina Media Pro (http://www.inamediapro.com/en/)
- **Research oriented databases**
  - BAFVSC, video artists (http://www.studycollection.org.uk/)
  - British Artists' Film & Video Study Collection (http://www.studycollection.org.uk/)
  - Moving image research collections, University of South Carolina (http://mirc.sc.edu/)
- **General libraries with important movie collections**
  - Library of Congress Moving Image Collection (https://www.loc.gov/rr/mopic/findaid/mpfind.html)

Audiovisual specific topics/collections or projects

- Artube (http://www.artube.fr)
- Asta Nielsen Database (http://importing-asta-nielsen.deutsches-filminstitut.de/index.php?site=about)
- Cinemacontext (http://cinemacontext.nl/)
- Colonial Film Moving Image of the British empire (http.//www.colonialfilm.org.uk)
- Le cinéma au Québec au temps du muet, 1896-1930 (http://www.cinemamuetquebec.ca/)
- Lucerna (magic lantern) (http://www.slides.uni-trier.de/)
- Silent Era (http://www.silentera.com/)
- Thanhouser Company (http://www.thanhouser.org/index.html)
- The Bioscope.net, a blog on early cinema, no longer updated (http://thebioscope.net/)
- The Criterion Collection (http://www.criterion.com)
- The German Early Cinema database (http://www.earlycinema.uni-koeln.de/)
- The Prelinger archives (https://archive.org/details/prelinger)
- Women film pioneers project (https://wfpp.cdrs.columbia.edu/)
- Yovisto, academic movie search (http://www.yovisto.com/)

Remixes, mashups

- Found footage exhibition (https://www.eyefilm.nl/en/exhibition/found-footage-cinema-exposed).
- Interview with Julien Lahmi (http://www.lesinrocks.com/lesinrockslab/news/2015/01/julien-lahmi-le-cinema-recycle/)
- Mash up cinema (http://www.mashupcinema.com/en/presentation/)
- Open Images video challenge on Wikipedia (http://www.openimages.eu/blog/2014/12/video-challenge-on-wikipedia-as-a-way-to-stimulate-reuse-of-audiovisual-heritage/)
- Prelinger Archives mashups (https://archive.org/details/prelinger_mashups)
- Remix cinema (http://archive.oii.ox.ac.uk/remixcinema/)
- The Scene Machine (http://www.scenemachine.nl/)

Movie fan sites

- Finding quotes (http://www.quodb.com/)
- Jinni (http://www.jinni.com/discovery/online/explore?similarto=breaking-bad&page=2)
- Letterboxd (http://letterboxd.com/)

- Movielens (http://movielens.umn.edu/login)
- Open Film (http://www.openfilm.com)
- The Movie DB (http://www.themoviedb.org/)

Stock footage

- Footage.net: http://footage.net/
- BBC Motion Gallery: http://www.bbcmotiongallery.com
- Film Images (London): http://www.film-images
- AP Archive: http://www.aparchive.com/AboutUs
- Film images archives: http://www.filmimages-archives.com/
- Pathé catalog: http://www.patheinternational.com/en/catalogue.php
- Stockfootage library Getty: http://www.gettyimages.nl/footage
- National Film Board of Canada (NFB): http://images.nfb.ca

Clips databases

- Movieclips: http://movieclips.com/

VOD

- Cinemalink - www.cinemalink.tv
- HBO - www.hbogo.nl
- iTunes - www.apple.com/nl/itunes
- kijk.nl (SBS) - www.kijk.nl
- Mubi: https://mubi.com/
- Netflix - www.netflix.nl
- PatheThuis - www.pathe-thuis.nl
- RTL XL - www.rtlxl.nl
- Uitzending Gemist (NPO) - www.uitzendinggemist.nl
- Videoland - www.videoland.com
- Ximon (no longer existing)

Production/exhibition companies sales catalogs

- Fondation Jérôme Seydoux-Pathé (http://fondation-jeromeseydoux-pathe.com/).
- Gaumont (http://www.gaumont.fr/fr/qui.html).
- CNC, Centre National de la Cinématographie ("depot legal", rights information, it is possible to access the contracts)

Digital libraries, data sources, and newspaper databases

- Bioscoopbond (http://dutch-facts.nl/nederlandse+bioscoopbond)
- Centraal Bureau voor de Statistiek in The Netherlands (http://www.cbs.nl/)
- Gallica, the digital library of the French National library
- International Institute of Social History (http://socialhistory.org/en)
- Media History Digital Library (mediahistoryproject.org)

- Reclamearsenaal (Site for posters and advertisement materials. It is a collection of private collectors interested in advertisement in a general sense, they do it through the international Institute of social history, they have a lot of online pictures.) (http://www.reclamearsenaal.nl/index.php?id=522)
- The Infomedia database. It contains more than eight million articles from Danish newspapers, trade journals and news agencies.

Digital research (data-driven) tools

- N-gram viewer by the DBNL (http://www.dbnl.org/zoek/ngram.php)
- Media analysis tools: Merdes, Comerde, Trove (http://www.clariah.nl/projecten/zaaigeld-projecten/trove/samenvatting)
- Visualizing Vertov, Cinema Histories, and other related projects by Lev Manovich: (http://lab.softwarestudies.com/2008/09/filmhistoryviz-1500-feature-films.html)

Good examples of collection access

- Beeldbank Stadsarchiev (for visualizing photo collections) (http://beeldbank.amsterdam.nl/beeldbank/indeling/grid?q_searchfield=du+midi)
- Foundation Jerome Sedoux (Repertoire Mayer) for ideas on how to present paper archives online (http://www.fondation-jeromeseydoux-pathe.com/repertoire-mayer)
- Staat archief Amsterdam – Beeldbank (for visualization of photo collections)
- TCM (Turner Classic Movies, several interesting features and functionality) (http://www.tcm.com/)
- Tropenmuseum (for visualization of graphic collections, especially the Papuacollectie.ab-c.nl)
- Trove (Digitized newspapers and more, Australian project) –for annotation functionalities: http://trove.nla.gov.au/ndp/del/article/138230585?searchTerm=%20holland&searchLimits

Collection access and presentation systems/sites used at The Eye Film Institute in The Netherlands (EYE)

- BibliotheekBibis: (http://bibliotheek.eyefilm.nl/)
- Digital film access (www.t3licensing.com/*eye)*
- EFG-1914 (http://project.efg1914.eu/)
- Eye basement exhibitions (http://www.eyefilm.nl/exposities/basement)
- Eye international (http://international.eyefilm.nl/Catalogue.html)
- Eye Open Belden (http://eye.openbeelden.nl/)
- Film in Nederland (http://www.filminnederland.nl/en/film-database)
- Instant Cinema (no longer available) (http://www.instantcinema.org/)
- The Scene machine (http://www.scenemachine.nl)

Appendix N. *Crowdsoucing* initiatives and *nichesourcing* initiatives

This appendix includes: (1) a brief categorized list of current (or past) *crowdsoucing* projects promoted by film archives, and (2), suggested ideas for future *crowdsoucing* or *nichesourcing* projects at film archives.

For the first part, the 34 film archives that are part of the European Film Gateway (EFG), the European film archives' aggregator, were selected. Each website was visited by observing the home page, the collection pages, the catalog (if there was one), the news site, and any other page that was related to collections, services and consultation. If the sites were in other languages, a web translator was used, since the English version of several sites was usually poorer or different. In addition to direct observation of this sample, also initiatives referred by other researchers were included. The main source for this was the article by López-De-Solís and Martín-López, (2011). Some of these initiatives are not necessarily named explicitly as *crowdsoucing* projects. Given the fact that initiatives involving the public are very scarce in the film domain, the only criterium taken into account was if there was an explicit call for user participation or contribution, that is why, also some (offline) events are included.

This small survey was done in two phases: in the beginning of the thesis work (2011) and at the end (2015). The list below corresponds to the updated version. All links and data were checked on November 2015.

The second part includes a brief list of ideas for future *crowdsoucing* or *nichesourcing* projects , initiatives, or tasks. This was made mostly based on the research questions and projects identified during Study C. The classification made by Oomen et al.'s, (2014) (Table 1.1) is used as a basis to categorize the initiatives.

This list will be updated and made available at this website:
https://collaborativearchives.wordpress.com/ .

Implemented initiatives

First the initiatives that are still taking place are presented, followed by initiatives that no longer exist (identified with an X icon).

- ✓ **"The Estonian Film Database (EFDB)"** *(Complementing: Collecting)*

With the occasion of the 100 year anniversary of Estonian film, the national archive, "Eesti Filmiarhiiv" in Tallinn, Estonia, presented this project to create an "electronic national filmography," continuing previous projects that started in 2007 with the same purpose. It is a eigh-year public project (2009-2017), which already received national recognition (an awar in the best civil society e-service).

The project invites people to contribute with information to the database. It seeks updates to the filmmakers' "CV" homepage, donations (including film-related materials), films about Africa, and memoires (letters or personal archives). These contributions can be done through a "contributor zone," which asks participants to submit details through contact forms.

More information at:

http://www.efa.ee/web
http://www.efis.ee/en/about-efdb/overview

- ✓ **"The Finish film database"** *(Complementing: identifying, classifying)*

The Finish film archive ("Kansallinen audiovisuaalinen arkisto") in Helsinki is responsible for "Elonet", the

Finish film database "Kansallisfilmografia". It requests people to participate in identifying and describing: places and locations (i.e., city streets, buildings, hotels, shops, etc.); or persons who worked in movies (e.g., filmmakers, musicians and singers). This can be done for selected clips based on topics, or for selected scenes from specific films. The clips and categories are provided in the database, and a form opens in each of them with structured fields to submit the contribution.

More information at:

http://www.elonet.fi/fi

- ✓ **Scholar Collections** *(Complementing and contextualizing)*

WGBH in The United States offers one section in its website called "Scholar Collections." This is part of a project completed in 2013 where scholars were granted access to WGBH material of all kinds of topics and then created articles based on their research. The site offers those articles, as well as related media and content, are now available on Open Vault as part of the Scholar Collections.

More information at:

http://blog.openvault.wgbh.org/2014/10/the-new-open-vault/

- ✓ **Researchers' stories at the film archive's site** *(Contextualizing)*

The Bill Doublas Cinema Museum at the University of Exeter, presents a YouTube channel where the videos are not film scenes, but stories recorded by researchers who make use of the archives' collections. The project is called "Objec stories," released in 2015.

More information at:

http://www.bdcmuseum.org.uk/news/bdc-museum-on-youtube-object-stories/

- ✓ **"Help us collect"** *(Collecting)*

The Scottish Screen Archive at the National Library of Scotland (Glasgow)requests voluntary donations of films, and also film-related materials relevant for the history of cinema in Scotland.

More information at:

http://www.nls.uk/collections/moving-image-archive/help-us-collect

- ✓ **"Films en quête d'identification" / "Films yet to be identified"** *(Complementing: identifying)*

"Archives françaises du film du CNC" (Bois d'Arcy) requests collaboration in identifying orphaned films and film fragments that have not been possible to identify by the archive's staff. It shows stills and basic information of each film and presents a contact form for the users' contributions.

More information at:

http://www.cnc-aff.fr/internet_cnc/Internet/ARemplir/AideInconnu.aspx?Menu=MNU_AIDEID

- ✓ **"Lost films"**

Promoted by Filmmuseum and TV Berlin. It is an initiative to gather and documenting film works that have been declared as losts. Register users can provide their contributions.

More information at:

https://www.lost-films.eu/index/about

- ✓ **"Pratiques de l'annotation video: journée d'études" ("Practices of video annotation: study day")**

Workshop that took place at the National French Library, which integrated information system designers, scholars, and the memory institutions around the topic of services based on audiovisual heritage annotation.

More information at:

http://cinecast.fr/?cat=12

- ✓ **The Clipper Project**

Clipper: Enhancing Time Based Media for Research. A collaboration between The City of Glasgow College, The Open University and Reachwill Ltd. Funded by JISC. Attempts to support researchers in doing time-based media annotation.

More information at:

http://blog.clippertube.com/

- ☒ "Treasure Hunt" (Collecting).

A website created by the BBC in 2001 featuring clips from recently recovered TV shows. It was used to make a call requesting people to search for lost films, providing details of who to contact in case someone found something the BBC could be interested in.

More information at:

http://www.thiswaydown.org/missing-episodes/bbchunt.htm
http://www.bbc.co.uk/cult/treasurehunt

- ☒ "Inconnu à ce jour" (Identifying)

Télévision Suisse Romande in Switzerland, nowadays Radio Télévision Suisse, made a call to the public in 2006 for identifying people, sequences and places depicted in the images they made available in their website.

More information at:

http://www.lagrue.ch/archives/2006/06.02.18/magazine.htm

Suggested initiatives (generic)

On a practical level, *nichesourcing* initiatives should be implemented carefully by examining the pros and cons of each variety of collaborative annotating activities. Research about different types of human computation and *crowdsoucing* described in this thesis (§2.6) (e.g., games with a purpose) can be used for future work in categorizing the different typologies and design strategies accordingly. Several forms of this collaboration for enhancing moving image annotation and access that have been identified in this thesis, and are summarized in Appendix N, could be taken as a point of departure. In the context of natural language processing, Wang, Hoang, & Kan (2012) developed a methodology to evaluate *crowdsoucing* initiatives for collecting annotations. This methodology should be applied to the audiovisual heritage domain before designing a *crowdsoucing* or *nichesourcing* initiative.

Other ideas, based on the findings from Study C, include:

(1) Scholars with a social media history focus require access to paper collections where

distribution and exhibition details of the media works and the exhibiting institutions are recorded. This documentation is usually not digitally accessible, or may be difficult to process, and/or may be kept in separate archives (e.g., municipal archives). Fine-grained content descriptions of the media works are not needed for satisfying the needs of these scholars. Instead, supporting data extraction, transcription, and correction, and linking between different datasets is of high importance to enable accuracy in research[204].

(2) Supporting scholars with a cultural/documental research focus may require fine-grained access to content, based on time-based annotations, in order to enable locating objects depicted in the moving images. At this level, collaboration with different expert niches in the annotation process is more necessary, since a curator or specific domain expert will obviously never be an expert on every potential object of interest. It is in this specific form of content description that the most representative initiative in the audiovisual domain (i.e., the *"Waisda?"* project) and current *crowdsoucing* research for moving images (Geisler et al., 2011, 2010) is been based.

(3) Scholars with an aesthetic/narratological focus, mainly film historians, may expect complete details about the holdings of a given archive's collection (and possibly copy information from each film and media item) as well as full access to viewing these items and related documentation. In this case, the scholars' contribution with identification information of film or media works, or by providing different types of textual content annotations at the item level (i.e., critical synopses), can be more relevant[205].

(4) Supporting scholars with a data-driven focus may require sophisticated automatic data-extraction mechanisms (in the case of media historians), or content-features extraction systems[206], combined with structured support for manual annotation. These emergent methods and systems may be perceived as a threat for traditional film archives, instead, they can be an opportunity for the archive to experiment with automatic content-based retrieval systems that are mostly used in the television field, for instance, by requesting expert participation for the evaluation of automatically extracted entities or concepts, or to contribute with expert concept refinements to automatically extracted low-level concepts. These tasks could be performed when viewing for the purpose of close (formal) analyses

[204] A research report about the impact of optical character recognition (OCR) errors in historical research showed that indeed there are cases in which these technical digitization problems may impede the work of the scholar or introduce biases that are difficult to evaluate by the scholar (M. C. Traub, van Ossenbruggen, & Hardman, 2015). As suggested in the typology of *crowdsoucing* projects in the introduction (§1.2), and with the two published examples of *nichesourcing* to date (§2.5.3), several *crowdsoucing* projects target transcription-related tasks. A representative example is the "Transcribe Bentham" project (Causer, Terras, & Hildebrand, 2014) *crowdsoucing* project.

[205] There is evidence that serendipitous encounters only succeed in the open web when media items are clearly identified and are accompanied by authoritative provenance and contextual information. For example, film archives are starting to put clips online as part of their records, to illustrate a movie (e.g., as teasers). However, it is possible that these clips are downloaded and reused by different users for several purposes. Thus, these clips must have embedded metadata about fragment identification, descriptions of which sequence/scene they correspond to, and preferably a clear statement of the criteria used in the selection. Also, the version (and possibly the characteristics of the original print that was used for the digitization) should be clearly stated in order to support thorough scholarship.

[206] Examples of CBIR applied to research are presented in §2.4.2. A concrete example of this type of research is the "Desmet" project, introduced in Appendix P.

needed by the scholar. Currently, access to digital moving images may not be possible to be done online in all cases, but on-site, or through a password protected interfaces, for which the scholar has to create a user account. In the case of publicly accessible digital films, these experiments with CBVR systems could be combined with teaching activities that intend to train students in cinematographic language (§5.6). On the media history side, researchers have in this data-driven approach, an opportunity to increase their "collective intelligence" by collectively connecting datasets. Obviously, the film archive would be the ideal institution to promote, coordinate, or participate in such initiatives[207]

[207] The case presented in Appendix P shows the need for more studies about collaborative moving image annotation for supporting data-driven research..

Appendix O. A proof of concept of information-annotating support

Eye, together with the University of Amsterdam, submitted a proposal to one call for funding called "Kennis Innovatie Mapping" (KIEM), which is designed for projects written in partnership between small to middle Dutch public organizations and a university. The proposal (from now on called "KIEM project") consisted in developing an innovative approach to present Eye's film collections online, by creating an information processing system which was initially intended to provide access to one specific Eye's collection (the Jean Desmet collection). The information system to be developed is called the "demonstrator", and is part of this collaborative project between the University of Amsterdam, Eye, Utrecht University, and the software companies Hiro and Dispectu.

During the initial stage of the KIEM project, the author of this thesis was given the possibility to collaborate with the team by conducting a study to gather the "user requirements" for the design of the "demonstrator".

Jean Desmet (1875-1956) was the first film distributor and cinema owner in The Netherlands. During his career, mostly between 1907 and 1916, was one of the most active businessmen in the film area in Europe. His collection was donated to Eye after his dead in 1956. The collection consists of a vast amount of films from different countries (around 900), and a rich publicity collection, including 2000 posters, 700 vintage photographs, as well as Desmet's business archive, a series of documents (circa 120.000 scans) where he registered all the transactions related to the films he distributed. These datasets are related to the film distribution activities of Jean Desmet, thus chiefly centered on the same set of films and their screenings in movie theatres (van Gorp, Olesen, Fossati, & Noordegraaf, 2014). The collection was declared part of the UNESCO world heritage in 2011 (Blom, 2012).

It is important to clarify that I did not participate in the idea of the KIEM project itself or in its further development, and the project as such is not part of this thesis.In that case, key research questions of the scholars were:

- Which films were offered to Desmet?
- When Desmet imported a film?
- Which films were bought by Desmet? identify this with a package
- Which films were distributed by Desmet to other cinemas?
- Which films were finally exhibited in the theaters?
- Which films did Desmet program in his own cinema (are they are the same)?, or which films were not screened at all?
- In which order/arrangement were the films bought and distributed? (Reconstruct a daily program?)
- How a "program" was arranged (types of films and their order) and if this arrangement was changed from how it was originally offered to Desmet: "The idea was to have a look to the films that Desmet actually bought and then look at what he

distributed in the NL, and see if there were any patterns appearing, like if he bought a package of films, if he just took the packages and sent them to the cinemas or if he did something with it himself, like maybe take out films, or replace films, or keep longer films and others not, anything" (Eye's curator)

- Where did Desmet send the films, when, for how long, and which films?
- Which are the genres per country for the films Desmet bought and distributed? (different combinations of genre and nationality, e.g. French comedies)
- Color information on films (by genre, country, distribution & exhibition)
- Show the films' posters
- Where do these posters come from? (Language of posters)
- Which posters are based on which photographs? (Comparison)
- Are the packages of films that Desmet received or bought the same as the packages that he distributed? Or does the order change?
- Is there a pattern in the films that Desmet sent? For instance, does he always send a comedy and a travelog, a longer film and a melodrama? (Eye's curator)
- Which films did Desmet program, which genres did this films have, also stylistic features (use of color) (scholar with an integrative perspective).
- In the case of cinema: who is in. In Desmet: what theaters he owned, what was programmed (a film screening is an event), time-space-people. And this is not only in Amsterdam, in the case of Desmet we know he bought the films in Europe. At the end you want an interface that allows you to see developments over time, if there are shifts in patterns where he gets the films from in a certain year or decade. The bigger question is how this new cultural industry emerges (network analysis is one part) (*participant-scholar*).

Other questions were related to exhibition research in a longitudinal way. Audience and reception research was an emergent topic, mainly lead by the "Homer group" (Daniel Phillips, Bielterrais, Gent) (film scholar), about audience reception and critical reception.

With the aim of facilitating the task of designing the "demonstrator", the requirements study digged into the connections between all the materials in the Desmet collection. Figure O.1 shows the complexity of the connections between the data sets that are needd in order to answer the specific research questions of the scholars mentioned above.

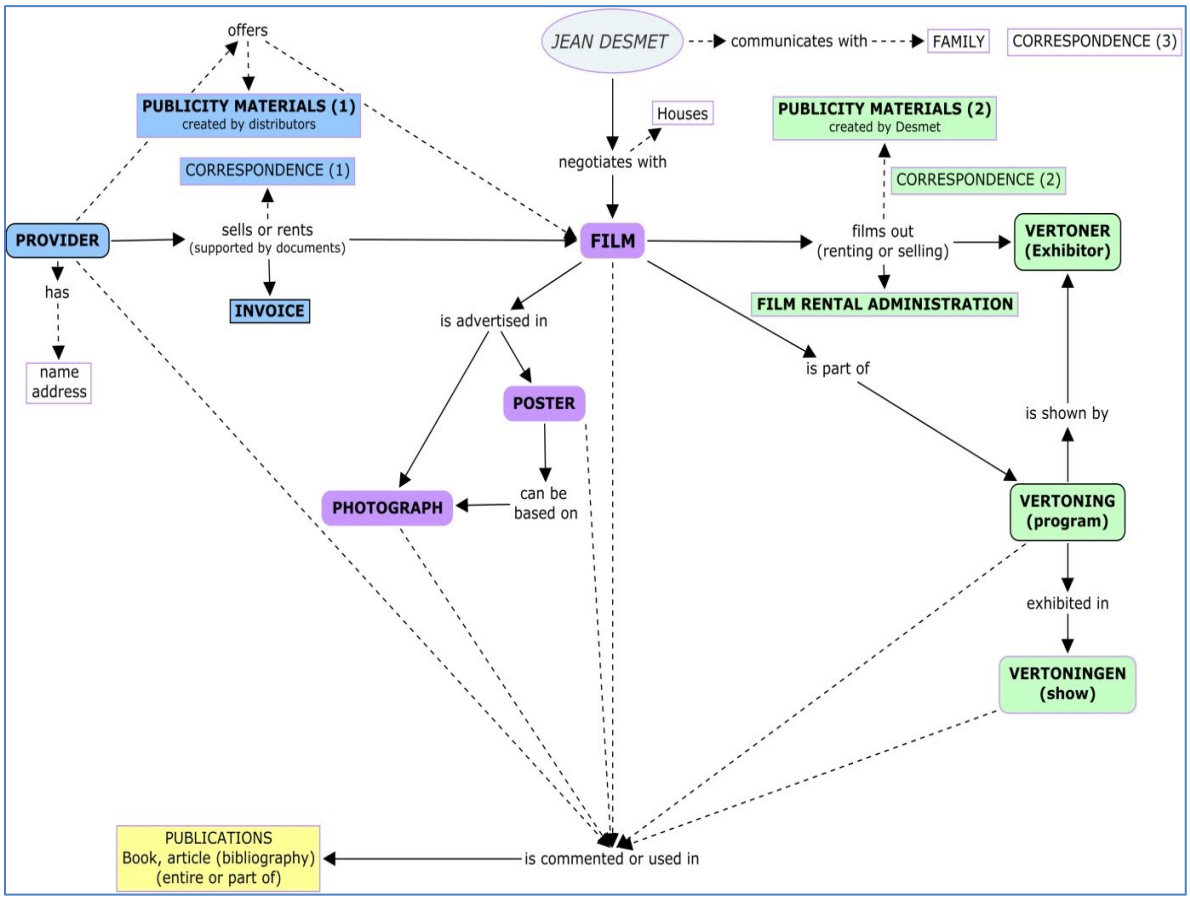

Figure O.1. Interconnections between all types of materials in the Desmet collection

In this study, it was found that the missing link for the "demonstrator" to work was to have all the data about exhibition and distribution extracted in a structured way. On the contrary, hundreds of bills and manual registries by Desmet were digitized by Eye, but only a small portion of the data was entered in a database (Jonkman, 2007).

For this reason, a *nichesourcing* solution was proposed, in which film scholars would be invited to consult the paper archive, and be asked to contribute with their annotations in exchange, but also as a way of enabling the research process itself, since because the data extraction, the "demonstrator" could not support in answering the requested research questions.

It was also suggested to introduce an annotation and data extraction functionality for the scanned documents from the Desmet's paper archive. In this way, they could be consulted by the scholar, while at the same time extracting the necessary data for the information sytem (the "demonstrator"). The list of film titles could be connected to the film archive's catalog, in order to guarantee consistency. At the same time, scholars could enter transcriptions or comments, that at a later stage the archive's curators could check for title suggestions or other details that could enrich the catalog data. This annotation platform was thought to be part of the "demonstrator", but ideally it should be integrated to the archive's catalog itself, in order to convert it in a "collaboratory."

At the same time, other information processing tools are used for processing information on color and other technical features. For instance, in order to obtain color information, automatic metadata extraction as that proposed by Lev Manovich is needed, but for obtaining information about genres and dates of exhibition, a semi-manual extraction of data from the paper archive is needed.

In this way, the Desmet “demonstrator” case shows the importance to combine manual annotations with automatic ones. This is because the research questions that drive the team’s explorations are related both to intrinsic qualities of the films distributed by Jean Desmet, as well as to the program arrangements and geographic data associated to the circulation of the films in different cities in The Netherlands and other countries in Europe.

However, there is a need for further research into the details on how to support collective research based on collective annotations created by researchers and archivists.